State Input on Long Term Revisions to the Lead and Copper Rule
Public Education & Transparency
Oct. 3, 2016, 1-2 pm EDT
Room 2339; Ex. 6 Personal Privacy (PP) **access code** Ex. 6 Personal Privacy (PP)

Agenda

1:00-1:10 Welcome and Introductions

1:10-1:50 Potential Discussion Questions for States

1. What are the challenges to expanding public outreach programs in the ways recommended by the National Drinking Water Advisory Council?
2. Is there a need for ongoing public education to all consumers beyond the NDWAC recommended language revisions to the mandatory lead statement in the annual CCR?
3. What should be the frequency of PE to residents with a LSL?
4. What should be the frequency of PE to locations that have or serve vulnerable populations (i.e., schools, childcare facilities, WIC centers, pediatricians, etc)
5. How should PWSs notify customers of LSLR/LSL disturbances during planned maintenance and emergency repairs?
6. What information should be made available to the public and how?
7. Is the establishment of a national clearinghouse a viable and effective way of communicating with the public and other stakeholders on issues of lead in drinking water? If so, what types of information should a clearinghouse contain?

1:50-2:00 Wrap Up and Next Steps

NDWAC recommendations:
The National Primary Drinking Water Advisory Council's (NDWAC) Lead and Copper Rule (LCR) working group made a series of recommendations for changes to the rule's public education requirements. The NDWAC's recommendations were based in part on the assumption that targeted outreach would be key to the success of lead service line (LSL) removal. The NDWAC said that the current rule does not adequately focus on creating ongoing opportunities to educate customers on the risks of LSLs or on opportunities to replace them, especially when consumers might make decisions to address the issue, such as at the point of a property sale.

The advisors noted that public education programs should improve consumer understanding of:

- The risks of lead in drinking water;
- The likelihood that the water in a home may contain lead; and
- The fact that the LCR is a shared responsibility rule; and
- The availability of additional resources that consumers can use to minimize exposure to lead.

The NDWAC recommended the following key elements for public education under the LCR:

- Establish an easily accessible, national clearinghouse of information about lead in drinking water to serve the needs of the public and of public water systems.
- Require information be sent to all new customers on the potential risks of lead in drinking water.
- Revise the current Consumer Confidence Report language to address lead service lines, to update the health statements, and to add requirements for targeted outreach to customers with lead service lines.
- Strengthen requirements for public access to information about lead service lines, tap monitoring results, and other relevant information.

Expand the current requirements for outreach to caregivers and health care providers of vulnerable populations.

Public Access to Information

The NDWAC recommended that water systems should increase the availability of data to the public. This would include:

- The number of samples over the Household Action Level in the last monitoring period, the highest level found during the last monitoring period, the median levels, and the most recent 90th percentile level compared to the "system action level" (renamed from the current action level).
- Requiring water systems to include WQP-related information on their webpage, or in the CCR or some equally accessible manner (e.g., CCT treatment, approved WQP ranges, WQP results from the last monitoring period)
- Encouraging water systems to post additional information on their webpages such as: o Public education materials (and link to National Clearinghouse).
    - o Sampling protocols the water system provides to customers to use when collecting lead samples and any variations from EPA recommendations.
    - o Individual sampling results (with appropriate privacy provisions such as address redaction).
    - o Inventory (such as a map) of confirmed and presumed lead service lines.

Where a community has lead service lines, EPA should require PWSs provide a public statement of lead service line ownership and the legal basis of said determination.

Cover letter available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2016-01/documents/ndwacrecommtoadmin121515.pdf"]
Full report available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2016-01/documents/ndwaclcrwgfinalreportaug2015.pdf"]

Other stakeholder input:

<u>NDWAC Lead and Copper working group member, Dr. Yanna Lambrinidou</u>

In her dissenting report, Dr. Lambrinidou said that a public education program should be well-targeted so that it results in a change in consumers' daily water use practices that minimizes exposure to lead. She said that a revised public education requirement under the LCR should be proactively public-health focused, rather than reactively focused on emergency and remediation.

Dr. Lambrinidou suggested that a proactive public education requirement would mandate that public water systems:

1. Develop, update, and post online a comprehensive database of local stakeholders.
2. Create a task force that draws from this database and places heavy emphasis on broad representation from low-income neighborhoods, neighborhoods with a high concentration of LSLs, and parent-to be/parent groups.
3. Develop locally-appropriate, long-term, and multimedia public education programs that meet well-defined EPA requirements.
4. Hold at least one annual meeting with all stakeholders to go over matters such as the mechanics of lead in water, the health risks of exposure, key messages for consumers, and to generate new ideas for improved community outreach.

Dr. Lambrinidou also recommended that in cases where tap sampling at an individual home exceeds a proposed household action level, consumers also have a right to a comprehensive assessment of the sources of the lead contamination.

Access to public information

Dr. Lambrinidou said that consumers have a right to clear, straightforward, and unambiguous information about the health effects of exposures to lead in water for fetuses, infants, and small children; and she said that water systems should convey the fact that under the LCR, it is up to consumers to take appropriate precautions to prevent exposures. Toward this goal, she said that consumers have a right to a comprehensive inspection of their servicer line materials as well as comprehensive lead-in-water testing. Similarly, in cases where tap sampling at an individual home exceeds the proposed household action level, consu8mers also have a right to a comprehensive assessment of the sources of the lead.

Finally, she said that consumers have a right to access freely and easily all lead-related information pertaining to their jurisdictions, including:

- All tap-sampling results with complete addresses and dates of collection;
- Sampling protocols;
- Corrosion control treatment
- full disclosure of invalidated samples;
- How a utility achieves compliance with the LCR;
- What LCR compliance actually means for public health;
- What constitutes a proper lead-in-water sampling program; and
- What constitutes a proper lead-in-water sampling program.

Full report available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2015-11/documents/ndwaclcrstatementofdissent.pdf"]

Flint Water Advisory Task Force Report (3/21/16)

Findings and recommendations regarding the Flint water crisis from the task force appointed by Michigan Governor Rick Snyder.

- The LCR should call for frequent and accessible public outreach and education on lead-in-water risks, including instructions on steps consumers can take to protect themselves. The LCR should require utilities to provide customers with explicit and urgent public notification of lead risks associated with activities that may cause physical disturbance of LSLs; inform customers when a LSL is present at their home; and provide customers clear information on how to request testing of lead-in-water levels in their homes.

Joel Beauvais Letter to National Water Tribal Council (7/19/16)

Based on EPA identified practices and policies that primacy agencies are using to enhance implementation of the LCR beyond the required rule provisions.

- Promote transparency with public water systems by posting individual lead compliance samples and 90% percentile values on their public websites;
- Shorten reporting and notice timeframes by providing notices to consumers as quickly as 48 hours after sampling.

National Water Tribal Council (NWTC) Response (8/30/16)

The NWTC agreed with and supported Joel's request to encourage Tribal utilities to implement LCR best practices. The NWTC highlighted additional practices that can enhance implementation of the LCR.

- Transparency is important with water testing.
- An additional consultation about the dangers of lead in drinking water with any residence that tests above the action level (At Risk Residences) is more meaningful in protecting health.
- Advising At-Risk Residences about fixture replacement, the added risk of using water from a water heater for consumption, and the importance of knowing the plumbing in your home.
- Shortening reporting time and notice timeframes. The residence deserves prompt notification but 48 hours is only reasonable if the action level is exceeded.
- Utilities should be encouraged to work with schools, daycares, and other transient locations to identify potential risks. This can be done at the cost of the establishment but with the option to put up signage and confirmation of being a Certified Safe Zone.

Message

From: Grevatt, Peter [Grevatt.Peter@epa.gov]
Sent: 4/10/2014 1:19:28 PM
To: Alan Roberson [ARoberson@awwa.org]; Burneson, Eric [Burneson.Eric@epa.gov]; Bergman, Ronald [Bergman.Ronald@epa.gov]
CC: Clark, Becki [Clark.Becki@epa.gov]; Lopez-Carbo, Maria [Lopez-Carbo.Maria@epa.gov]; Bissonette, Eric [Bissonette.Eric@epa.gov]; Mason, Paula [Mason.Paula@epa.gov]
Subject: RE: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments

Sounds good Alan. I'll ask Paula Mason to reach out to you to schedule a time. Thanks!

From: Alan Roberson [mailto:ARoberson@awwa.org]
Sent: Wednesday, April 09, 2014 8:45 PM
To: Grevatt, Peter; Burneson, Eric; Bergman, Ronald
Subject: Fwd: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments

Peter and Eric and Ron, we should probably talk soon about the updates the Deputy Administrator has been talking about as we have some ideas. I am out of pocket for a bit but open the week of April 21. Alan

Sent from my iPhone

Begin forwarded message:

> **From:** Tommy Holmes <THolmes@awwa.org>
> **Date:** April 9, 2014 at 2:39:33 PM MDT
> **To:** Alan Roberson <ARoberson@awwa.org>, Steve Via <SVia@awwa.org>, Tom Curtis <TCurtis@awwa.org>, Kevin Morley <KMorley@awwa.org>, Adam Carpenter <acarpenter@awwa.org>
> **Subject: FW: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments**
>
> --
> From: BNA Highlights[SMTP:BHIGHLIG@BNA.COM]
> Sent: Wednesday, April 09, 2014 2:40:23 PM
> To: Tommy Holmes
> Subject: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments
> Auto forwarded by a Rule
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Latest Developments

EPA 'Likely' to Issue Final RFS in June, McCarthy Says

Posted April 09, 2014, 10:42 A.M. ET

Environmental Protection Agency Administrator Gina McCarthy tells a Senate Appropriations subcommittee April 9 that the agency will "likely" issue a final 2014 renewable fuel standard in June.

"It should never go beyond that," McCarthy said, adding she hopes the agency can propose the annual targets more quickly in the future.

In November, the EPA proposed requiring petroleum refiners and importers to blend 15.21 billion gallons of renewable fuels in 2014, substantially less than the 18.15 billion gallons Congress mandated under the 2007 Energy Independence and Security Act.

EPA Official Urges Localities to Update Source Water Plans

Posted April 09, 2014, 4:06 P.M. ET

In light of the chemical spill in West Virginia's Elk River, the second ranking Environmental Protection Agency official said publicly owned drinking water utilities ought to begin updating their source water protection plans to be prepared to deal with threats to drinking water supplies.

At the National Clean Water Policy Forum, EPA Deputy Administrator Bob Perciasepe said source water protection plans, which should have been completed by 2003, have not been updated since then. "I mentioned this to drinking water folks earlier this week and I'll reiterate it here that it's not a bad time now to take those off the shelf and take a look at them to see what has been done and what hasn't been implemented and what's missing."

Source water constitutes from rivers, streams, reservoirs and aquifers that is treated and used for drinking water purposes. Under the Safe Drinking Water Act, states are required to develop and implement source water assessment plans. This is a process for evaluating a public water system's source water and assessing its vulnerability to contamination. Based on the information in the assessment, utilities develop plans to assess those risks. Utilities are under no obligation, however, to implement those plans.

Without naming Freedom Industries, Perciasepe said the facility that was the source of the chemical that contaminated the drinking water supplies of Charleston residents was identified in West Virginia's 2003 source water protection plan.

Perciasepe said that "the preparedness part is as essential as the identifying part. We have learned that."

Existing Water Act Authorities Suffice for Stormwater: EPA Official

Posted April 09, 2014, 4:05 P.M. ET

The top ranking Environmental Protection Agency water official said April 9 that the agency decided to defer national stormwater rulemaking after recognizing that it has the existing authority and tools under the Clean Water Act to tackle the problem.

"The reason is because we feel like there is a lot of existing authority and tools to accomplish the same goals. We need to maximize what we can do by creating incentives," Nancy Stoner, EPA acting assistant administrator for water, said on the final day of the April 7-9 National Clean Water Policy Forum.

The agency had confirmed March 19 to Bloomberg BNA that it was deferring action on its rule to address stormwater from newly built and redeveloped sites and instead will provide incentives, technical assistance and other approaches for cities and towns to address it themselves.

EPA to Take a Year to Revise Lead-Copper Drinking Water Rule

Posted April 09, 2014, 4:12 P.M. ET

The Environmental Protection Agency plans to propose revisions to its 20-year-old lead-copper drinking water rule after an agency working group completes its deliberations, which should take "about a year," the agency's top drinking water official said April 9.

On the final day of the National Clean Water Policy Forum, Peter Grevatt, director of the Office of Groundwater and Drinking Water, said the revisions to the lead-copper drinking water rule would be issued following the deliberations of a work group that has been set up at the National Drinking Water Advisory Council.

Grevatt said the work group would be charged with looking at lead-sampling protocols and measures to replace lead service lines, among other issues.

He said there are 10 million lead service lines in the country. "It's a very expensive proposition to replace them all. The process is complicated because the lines are partly owned by utilities and partly owned by homeowners," he said.

The lead and copper rule requires drinking water utilities that have lead service lines and optimized corrosion control—but which still exceed the legal limit known as the "action level" for lead—to replace 7 percent of their lead service lines annually, replace the portion of the line that the system owns and offer to replace the customer's portion of the line at the customer's cost. A full line replacement would involve replacing the service lines from the water main to homes.

Final Clean Water Act Jurisdiction Rule Possible in 'About a Year' McCarthy Says

Posted April 09, 2014, 11:18 A.M. ET

Environmental Protection Agency Administrator Gina McCarthy says the agency will look to finalize a proposed rule clarifying its Clean Water Act jurisdiction in "about a year," but it will take "whatever time it takes to get this right."

The EPA will listen to comments and concerns about the proposed regulation, and it will consider rethinking language in the proposal to address those concerns.

McCarthy acknowledges there is significant distrust between the agricultural industry and the EPA about the proposed regulation, and she pledges to conduct significant outreach to address the industry's concerns.

"I really want this rule to work for the agriculture community," McCarthy tells a Senate Appropriations subcommittee during a hearing on the fiscal 2015 budget request for the EPA

The EPA and the U.S. Army Corps of Engineers issued the joint proposed rule on March 25.

Staff Cuts to Affect Technical Assistance, Grants, Perciasepe Says

Posted April 09, 2014, 3:18 P.M. ET

A reduced workforce at the Environmental Protection Agency owing to spending constraints will affect the level of grants and technical assistance that the agency can offer to states and localities, according to EPA Deputy Administrator Bob Perciasepe.

Speaking on the final day of the National Clean Water Policy Forum, Perciasepe said the agency is in the process of reducing its workforce by almost 2,000 people in response to budget constraints placed on its spending by Congress.

Most important, though, "all this will affect what kind of technical assistance we can give, what kind of state grants we can have, and what's going to happen to [state revolving funds]," Perciaspe said.

He said the EPA, which hasn't been immune to cuts in domestic discretionary spending, will have only so much money in discretionary federal spending. "We have to figure out the balance between different parts of it: the part that funds EPA's work, the part that funds grants for state operations, and the part that funds infrastructure and superfund so all of those are tight," he said.

House Transportation Passes Bill Limiting EPA Dredge-and-Fill Permit Authority

Posted April 09, 2014, 12:55 P.M. ET

The House Transportation and Infrastructure Committee passes a bill April 9 that would restrict the Environmental Protection Agency's ability to revoke a clean water dredge-and-fill permit after the U.S. Army Corps of Engineers has approved the permit.

The committee approved the bill (H.R. 524) on a 34-20 vote, largely along party lines with support from Republicans and some Democrats. Rep. David McKinley (R-W.Va.) and 10 co-sponsors introduced the bill Feb. 6.

Currently, the EPA may alter or revoke a dredge-and-fill permit at any time under Clean Water Act Section 404(c), even after the permit has been approved by the corps, if it determines the actions will cause unacceptable harm to the environment.

Potentially affected industries include construction, mining and agriculture, among others.

The EPA has revoked portions of a dredge-and-fill permit for a surface coal mine owned by Arch Coal Inc. in West Virginia. It also recently began the process under Section 404(c) to consider preemptively vetoing a Section-404 permit for the proposed Pebble Mine in Alaska, owned by Northern Dynasty Minerals Ltd.

DOT Plans to Set Minimum Crew Size for Crude Oil Trains

Posted April 09, 2014, 2:07 P.M. ET

The Federal Railroad Administration announced that it intends to propose minimum crew-size requirements for most mainline freight and passenger trains, including trains carrying crude oil.

The administration, in an April 9 statement, said that the proposed rule will likely require a minimum of two-person crews for trains carrying crude oil. The proposed rule also is expected to establish "appropriate" exceptions to the minimum crew-size requirements, according to the administration.

FRA Administrator Joseph Szabo said in an April 9 statement that the administration thinks the use of a multi-person train crew will enhance safety. "Ensuring that trains are adequately staffed for the type of service operated is a critically important to ensure safety redundancy," Szabo said.

Presently, FRA regulations do not include minimum crew-staffing requirements, but the current rail industry practice is to have two-person crews, according to the administration.

The safety of transporting crude oil by rail has been a priority for the Transportation Department, which is also considering new tank-car standards for cars in flammable liquid service.

A July 2013 derailment of an unattended train carrying crude oil in Lac-Mégantic, Quebec resulted in the deaths of 47 people.

DOT's Foxx Says Lack of Oil Industry Data Slowing Rail Safety Efforts

Posted April 09, 2014, 11:40 A.M. ET

Transportation Secretary Anthony Foxx told a Senate Appropriations subcommittee April 9 that the failure of the oil industry to respond to a request for data on the characteristics of crude oil from North Dakota's Bakken shale region is slowing down efforts to improve the transport of crude oil by rail.

Foxx told the Subcommittee on Transportation, Housing and Urban Development and Related Agencies that the DOT has received information from three individual oil companies but has not received "robust" data from the oil industry, despite a January request for as much information as possible. Foxx noted that the department is conducting its own testing of Bakken crude samples, but said a larger number of samples would allow for a better assessment of crude oil characteristics.

The lack of data sharing is slowing down the DOT's ability to inform Congress on the volatility of Bakken crude oil and slowing down efforts to coordinate with emergency responders on crude-by-rail safety, according to Foxx. The Pipeline and Hazardous Materials Safety Administration issued a safety alert in January cautioning that crude oil from the Bakken region may be more flammable than other types of crude oil.

Foxx also said federal regulators need a "comprehensive understanding" of crude oil characteristics to develop new standards for rail tank cars that are used to transport flammable liquids. The DOT is working on a "complete and thorough" tank car rule that would address the design of new cars and the safety of existing DOT-111 rail tank cars.

"It all starts with knowing what we're transporting," Foxx said.

Foxx said his target date for issuing a proposed tank car rule is "as soon as possible" but declined to provide a more specific timeline when asked by Subcommittee Chairwoman Patty Murray (D-Wash.) and Subcommittee Ranking Member Susan Collins (R-Maine).

Companies involved in Bakken: Marathon Oil Corp., ConocoPhillips Co. and Whiting Petroleum.

Murkowski: EPA Regulations Could Fundamentally Change Economy

Posted April 09, 2014, 3:10 P.M. ET

At a Senate Appropriations subcommittee hearing today, Sen. Lisa Murkowski (R-Alaska) says forthcoming EPA regulations on carbon pollution from power plants could jeopardize the affordability and reliability of electricity in the United States.

Murkowski says the power plant regulations are part of a broader, troubling pattern of EPA actions that could "fundamentally change our economy and the lives of the people we are here to represent."

The Alaskan Republican, speaking to EPA Administrator Gina McCarthy, also expresses concern over the agency's recently proposed rule on Clean Water Act jurisdiction, which she says would drastically expand the lands subject to regulation.

Oil Industry Wants Biodiesel 'Loophole' Closed in Fuel Credits Rule

Posted April 09, 2014, 2:37 P.M. ET

Allowing biodiesel producers to separate and sell renewable fuel credits creates more opportunities for fraud in the renewable identification number market, petroleum groups told the Environmental Protection Agency and White House during a recent meeting.

The American Petroleum Institute, American Fuel & Petrochemical Manufacturers and Exxon Mobil Corp. told the EPA and Office of Management and Budget to eliminate the ability of biodiesel producers to sever renewable identification numbers (RINs) from batches of fuels produced as part of an upcoming final rule establishing a quality assurance program for the fuels credit market. RINs are serial numbers attached to batches of renewable fuels that also can be severed and sold as credits to comply with the annual renewable fuel standard blending mandates.

"EPA must close the loophole for RIN separation, which has been the source of over 170 million fraudulent RINs. The volume of biodiesel used as neat transportation fuel is miniscule compared with the risk for RIN invalidity," the petroleum groups said in materials presented to the administration at the March 24 meeting.

However, biodiesel producers told the administration that it needs the revenue generated by selling its RINs during a separate March 24 meeting.

The EPA proposed the rule in February 2013. As proposed, it would establish qualifications for third-party auditors who would determine the validity of the renewable identification numbers (RINs)—serial numbers attached to batches of renewable fuels. It also would establish audit procedures for renewable fuel production facilities, including minimum frequency, site visits, review of records and reporting requirements.

As part of that proposed rule, the EPA is taking comment on whether renewable fuel producers should be allowed to separate and sell their own RINs. The EPA anticipates finalizing the rule in April.

Bill to Expedite LNG Exports Approved by House Panel

Posted April 09, 2014, 4:10 P.M. ET

A House Energy and Commerce subcommittee approves a bill (H.R. 6) April 9 that would automatically approve licenses to export natural gas to countries that are members of the World Trade Organization.

The Subcommittee on Energy and Power approves the bill on a 15-11 party-line vote and adopts one amendment from Rep. Bobby Rush (D-Ill.) on a voice vote. The Rush amendment would require the Department of Energy to disclose the specific destination of any liquefied natural gas exports.

Rush says consumers need to know whether natural gas exports actually reach Europe or will be sold to higher-priced markets in Asia.

Democrats say they plan to offer more amendments at the full committee markup, which will follow the two-week congressional spring recess. Those amendments will focus on the impacts to U.S. consumers and manufacturers of LNG exports, they say. No Democrats voted for the bill.

The Republican-sponsored bill also would approve the 24 LNG export license applications pending at the Energy Department. Rep. Cory Gardner (R-Colo.), the bill's sponsor, says the legislation is a response to calls for help from Eastern European countries that want to reduce their dependence on Russian oil and gas exports.

California Lawmakers Advance Bills on Fracking, Response Plan

Posted April 09, 2014, 4:21 P.M. ET

California's Senate Committee on Natural Resources and Water Quality April 8 advanced measures seeking to impose a moratorium on hydraulic fracturing activities at oil and gas fields and updates to the state's oil response program to address the risks of importing crude oil by rail.

Both bills now head to the Senate Committee on Environmental Committee for further action.

The measure to halt oil and gas well stimulation treatments, S.B. 1132, cleared the committee on a 5-2 vote.

S.B. 1132, however, did not have broad support from Democrats on the committee. Sen. Fran Pavley (D) provided the fifth vote needed to advance the bill that would ban oil and gas well stimulation activities throughout the state until a study can deem the activities safe for the public and environment.

Democrats, including Richard Lara, abstained from the vote, saying the measure would affect his constituents that work at oil and gas fields in Southern California.

If enacted, the measure would bar hydraulic fracturing, acidization treatments and other stimulation treatments used to improve mostly oil production in the state. Even if passed by the full Senate and Assembly, the fate of S.B. 1132 falls to Gov. Jerry Brown (D), who so far has not supported a moratorium on oil and gas well stimulation activities.

Guide Released to Improve 'Traceability' in Corporate Supply Chains

Posted April 09, 2014, 2:36 P.M. ET

The United Nations Global Compact and sustainability advisory group BSR released April 9 a guide to help companies improve "traceability" in their supply chains.

Currently, only a small percentage of commodities are traceable on sustainability issues, meaning companies can identify and track a product's path from raw material to finished good, the guide said. But traceability is becoming increasingly important to companies seeking to make their supply chains more transparent and meet their sustainability goals.

The guide uses examples of existing traceability systems for commodities such as biofuels, beef and palm oil to show companies which sustainability issues are relevant to each commodity and identify best practices in tracing it. Companies that are active in traceability efforts for those commodities include BP, McDonalds and Unilever.

NOAA Official: Right Economic Drivers Needed for Coastal Restoration

Posted April 09, 2014, 12:18 P.M. ET

The loss of coastal ecosystems is a problem that cannot be solved with government funding alone, a National Oceanic and Atmospheric Administration official said April 9.

"We have to get the economic drivers right" so that decision makers in the private sector, individual landowners and others consider the value of coastal ecosystem services in their investment decisions, Mark Schaefer, NOAA's deputy administrator, said during an event organized by the Center for American Progress and Oxfam America.

To help get those valuations right, Schaefer said decision makers need tools such as natural capital accounting that put a price on the benefits of coastal ecosystems. These ecosystems can provide benefits such as buffering storm surges, safeguarding coastal homes and businesses, and sequestering carbon.

EPA Seeks Advice on Applying Mixing Zone, Blending Policy Ruling

Posted April 09, 2014, 10:48 A.M. ET

The Environmental Protection Agency will use the latest scientific research to inform its decision on whether to relax nationwide policies on wastewater treatment practices during heavy rains in response to an appeals court ruling.

At the final day of the National Clean Water Policy forum today, Nancy Stoner, acting assistant administrator for water, said the EPA would publish a Federal Register notice to invite scientists to be on a panel that would advise the agency on whether public health would be served in applying nationwide a 2013 ruling handed down by U.S. Court of Appeals for the Eighth Circuit in Iowa League of Cities v. EPA.

In that decision, the Eighth Circuit rendered invalid the EPA's policies banning bacteria mixing zones in receiving water used primarily for recreational activities such as swimming, as well as the practice of blending partially and fully treated wastewater inside the treatment plants prior to discharge into nearby waters. The ruling also declared the ban on blending practices to be illegal under the Clean Water Act.

EPA was asked by representatives of the U.S. Conference of Mayors, the National League of Cities, the National Association of Counties, the International Municipal Lawyers Association and the National Association of Clean Water Agencies, which represents publicly owned municipal wastewater treatment plants, in November to end regulatory confusion by applying the appellate decision nationwide.

This email has been scanned for all viruses by the MessageLabs SkyScan
service.

Message

From: Thompkins, Anita [Thompkins.Anita@epa.gov]
Sent: 3/1/2016 12:18:32 AM
To: James Taft [jtaft@asdwa.org]
CC: 'Osterhoudt, Darrell' [dosterhoudt@asdwa.org]; Bergman, Ronald [Bergman.Ronald@epa.gov]; Lopez-Carbo, Maria [Lopez-Carbo.Maria@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]; Grevatt, Peter [Grevatt.Peter@epa.gov]; Greene, Ashley [Greene.Ashley@epa.gov]
Subject: RE: Suggested Next Steps on Lead in Drinking Water -- From States' Brainstorm
Attachments: Summary of Post-Flint Next Steps -- from States Brainstorm (2-29-16).docx

Hi Jim,

Thanks so much for convening a group of state drinking water experts and administrators to brainstorm short, medium, and long term suggested next steps regarding the LCR. We always appreciate ASDWA's engagement and look forward to our continued collaboration.

Thanks,
Anita

Anita Maria Thompkins
Director, Drinking Water Protection Division
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency

Phone: 202-564-5673
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From: James Taft [mailto:jtaft@asdwa.org]
Sent: Monday, February 29, 2016 2:59 PM
To: Thompkins, Anita <Thompkins.Anita@epa.gov>; Bergman, Ronald <Bergman.Ronald@epa.gov>; Lopez-Carbo, Maria <Lopez-Carbo.Maria@epa.gov>; Burneson, Eric <Burneson.Eric@epa.gov>; Christ, Lisa <Christ.Lisa@epa.gov>
Cc: 'Osterhoudt, Darrell' <dosterhoudt@asdwa.org>
Subject: Suggested Next Steps on Lead in Drinking Water -- From States' Brainstorm

Good afternoon EPA Colleagues –

A couple of weeks ago, we gathered about ten of our state lead in drinking water experts and administrators to brainstorm about potential next steps, in the wake of the Flint crisis. We posed the following question to them: "What do you think needs to happen – both short, medium, and long term – to improve our collective (State/EPA) implementation/oversight of the rule and improve public health protection?" The result of that brainstorm is the attached.

Given the contents of the soon-to-be released letters from the Administrator and the Office of Water, these points of view and suggested next steps may have been overtaken by events. But, we wanted to share them with you, in any case, as ideas to supplement and augment the next steps outlined on those letters. Thank you.

Jim Taft
Executive Director

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Key Points from Discussion with State Experts
about Needed Next Steps (Near, Medium, and Long Term)
in the Wake of the Lead in Drinking Water Crisis
February 29, 2016

Perspectives on State Oversight Role

- **State Oversight Role:** States don't believe there is widespread cheating on the LCR or that states are complicit or lax in responding to any cheating that may be occurring -- as has been suggested by some activists. However, that doesn't mean we can't collectively improve in our efforts to oversee implementation of the rule – we can; see the following bullets.

- **State Review of Sampling Data:** States may need to look more closely at the data submitted by water systems to verify that appropriate monitoring sites are being used. In many cases, due to state workloads and time constraints, the results may not typically get an in-depth review unless the results show an Action Level exceedance.

Potential Areas for Additional Guidance

- **Pre-flushing**: Some states or water systems may still be using sampling protocols that contain pre-flushing recommendations. ("Pre-flushing", as used here, refers to flushing *before* the 6 hour minimum stagnation time; not immediately prior to sample collection.) EPA should issue new guidance to clarify this point, since it doesn't appear to be specifically covered in the rule. EPA guidance should also address *maximum* stagnation time. Some states may have included this issue in their protocols to avoid outlier samples collected after excessive stagnation periods.

- **State Review of Corrosion Control:** One issue that arose in Flint was the level of review of the treatment, especially for corrosion control, when the source was changed to the Flint River. Again, some EPA guidance may be helpful to states to assist them in conducting an appropriate evaluation. (EPA has already begun to do so with their 11-3-15 memo on maintaining corrosion control treatment for large water systems.) States that have a good process in place should share those processes with other states. Systems may not undertake complete source changes like Flint very often, but bringing on new wells or adjusting the mix of multiple sources is commonly practiced by water systems; thus, states could use guidance on the appropriate level of review in these more common situations.

- **Sample Invalidation**: Another issue raised in the Flint situation is the matter of sample invalidation. States could use additional guidance from EPA on invalidation so that decisions are well supported and defensible -- and aren't so easily "second guessed" at a later date.

- **Examination and Implementation of LCR Best Practices in Advance of Rule Changes:** A number of issues related to the time frames in the rule need to be addressed in the revisions. Some of the current provisions in the rule and the associated, allowable time frames are not necessarily consistent with the high level of risk that the public perceives for lead. This potential disconnect includes the timeline for proposal, approval, and adoption of Optimal Corrosion Control Treatment and the lack of active tap sampling during this period. In the meantime, perhaps guidance can be developed by EPA, working with states, to help determine a reasonable approach and associated time frames; i.e., an approach that moves the process along faster than the maximum time limits in the rule. Something along the lines of a best practices guide for this and other aspects of the rule would be a good tool for states.

- **Do Not Drink Advisories for Lead:** EPA and CDC need to clarify when to tell customers not to drink the water – i.e., an acute health effects level. What criteria should states, local health agencies, and water systems use to make this determination? The recommendations need to take into account other sources of lead, not just the water. These criteria need to be developed as a national consensus, not in the heat of the crisis.

Long Term Changes

- **NDWAC Recommendations:** The NDWAC LCR recommendations, once adopted and translated into rule language and other actions, can help solve many of the problems related to Flint. States support moving that development process forward as quickly as possible. Beyond developing the proposed revised rule, we should collectively consider what good ideas from the NDWAC can be implemented *prior* to a revised rule, such as the lead in drinking water clearinghouse or moving forward with other agencies and entities (e.g., the real estate industry) to help incentivize and fund full LSL replacement. If the new rule does not ban partial lead service line replacements, it should define a process to minimize the partial lead service line replacements that are done.

- **Funding and Incentivizing Full LSLR:** Obviously, comprehensive funding is needed to completely eliminate lead service lines. A crisis-driven city-by-city approach is not where any of us wish to be. Without direct funding or effective incentives, only a small percentage of customers will likely be able to afford full LSL replacement. To accomplish lead service line replacement, more information is needed about how many there are, where they are located, etc. Information for the public about how to identify the presence of LSLs would also help. In addition, industry groups like AWWA, AMWA, and AMWA need to be encouraging their members to identify, and ultimately remove, LSLs. Some of the long term incentives that need to be worked on to achieve elimination of LSLs include:

  - Disclosure at the time of home sale (at a minimum)
  - LSLR could be linked to requirements for lenders like FHA that would mandate LSL removal.
  - Required removal prior to home sale – could failure to do so constitute entering lead pipe into commerce in violation of the Lead Reduction Act?

Communications/Messaging/Collaboration

- **Public Messaging in the Wake of Flint:** States need to get the message out to their citizens about actions that are taken in their state in order to help assure citizens that it's not happening here; and ongoing vigilance is needed to ensure that it doesn't happen in the future.

- **Communications of Near Term Changes in Approach, based on all Foregoing Recommendations**: EPA and states needs to collaborate on a communications strategy for all new information that's developed in the aftermath of the Flint crisis and help ensure that it is effectively disseminated and communicated to all levels of government – local, state, and EPA Regional.

- **Need for Coordinated EPA Approach in Concert with Regions and States:** Because of the Flint crisis, EPA Regions are asking for more information from their states about LCR implementation, scheduling visits, doing audits, etc. We collectively need to be sure that these efforts are part of a coordinated national approach. EPA also needs to be mindful of state reporting burden when asking for additional LCR information.

Message

From: Taft, Jim [jtaft@asdwa.org]
Sent: 7/29/2016 1:49:06 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]; Osegueda, Carlos [osegueda.carlos@epa.gov]; Thompkins, Anita [Thompkins.Anita@epa.gov]; Corr, Elizabeth [Corr.Elizabeth@epa.gov]; Bergman, Ronald [Bergman.Ronald@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]; Oshida, Phil [Oshida.Phil@epa.gov]; Travers, David [Travers.David@epa.gov]; Newberry, Debbie [Newberry.Debbie@epa.gov]
CC: Greene, Ashley [Greene.Ashley@epa.gov]; Wadlington, Christina [Wadlington.Christina@epa.gov]; Harris, Adrienne [Harris.Adrienne@epa.gov]
Subject: Summary of July 7th Conference Call between EPA-OGWDW Senior Managers and ASDWA's Board
Attachments: SUMMARY OF BOARD-EPA MANAGERS CALL (7-7-16).docx

Good morning EPA-OGWDW Senior Managers --

Please find attached a summary of your July 7th conference call with ASDWA's Board. Thanks very much for taking the time for this interaction with our state leaders.

****

Jim Taft
Executive Director
Association of State Drinking Water Administrators
1401 Wilson Blvd.; Suite 1225
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SUMMARY

Conference Call between ASDWA Board and EPA-OGWDW Senior Managers
July 7, 2016

Participants:

June Swallow, RI
Randy Ellingboe, MN
Sarah Pillsbury, NH
Lori Mathieu, CT
Roger Sokol, NY
Lisa Daniels, PA
Jessica Godreau, NC
Beth Messer, OH
Jeff Stone, AR
Howard Isaacs, NE
Mark Mayer, SD
Cindy Forbes, CA
Cindy Christian, AK
Darrell Osterhoudt, ASDWA
Jim Taft, ASDWA
Bridget O'Grady, ASDWA
Peter Grevatt, OGWDW
Carlos Osegueda, OGWDW
Anita Thompkins, OGWDW-DWPD
Elizabeth Corr, OGWDW-DWPD
Ron Bergman, OGWDW-DWPD
Eric Burneson, OGWDW-SRMD
Phil Oshida, OGWDW-SRMD

Program Planning/Priority-Setting:

FY 17 Budget: Grevatt noted that it's difficult to make any accurate projections, at this stage, about what Congress ultimately will do in terms of FY 17 appropriations. There will likely by a Continuing Resolution; and, of course, the legislative calendar will be affected by the fall elections. We've all seen a keen interest, in Congress' part, in water infrastructure investment and the SRFs -- more than we've seen in the recent past. There's also the possibility, in the final FY 17 appropriation, of funding for WIFIA loans. If the overall cap for Agency goes down and SRFs stay the same, the rest of the Agency's budget will be constrained. Administrator McCarthy has been clear that drinking water is among the Agency highest priories. Even a new Administration will likely have many of these same concerns. Mathieu asked whether the Agency has asked, in internal Administration discussions, for substantial increases for the PWSS, based on the grant's importance in supporting strong state drinking water programs. Grevatt noted that conversations along those lines have taken place between OMB and Congress. But, he observed that many on the Hill, in the current post-Flint environment, perceive the SRF as the principal program that needs to be increased to address the problem. Ellingboe said that, in his state, they're feeling the tension with the infrastructure program in terms of best use of these funds (i.e., set-asides vs. infrastructure spending). Grevatt appreciated that tension and agreed that the solution to state funding challenges is multi-faceted and *not* simply a matter of taking more in set-asides.

Priorities for Remainder of Calendar Year: The four items discussed in the late May/early June specially-convened stakeholder meetings track closely with the Administrator's priorities (i.e., LCR, emerging contaminants, infrastructure investment in disadvantaged communities, and the state/EPA partnership). In addition to looking at those topic areas, the Agency wants to put together a National Action Plan for Drinking Water. Other key priorities for the balance of the calendar year include finalizing the UCMR 4, 6 year review, and CCL 4 – as well as concluding the health effects analysis for perchlorate. There is currently – within the Agency at the highest levels -- an unusually heavy emphasis on drinking water issues.

Post Flint Activities Update:

Discussion of State-EPA Relationship: In response to a Board member's question about how state oversight/relationships have changed recently, Grevatt observed that Flint has obviously put a spotlight on these interactions and communications; which has led to reexamination of state program implementation practices. The approach that states and EPA are taking, in terms of enhancing LCR implementation, is one of the ways this has been manifested. The Agency has had to take an exhaustive, system-by-system approach to looking at and following up on (with states) lead action level exceedances (LALEs). However, that is not a sustainable approach for EPA or states and has required redirecting resources. Transparency of data and information is a key component of all of this; which highlights the importance of SDWIS Prime. Mathieu noted that the January 2014 ASDWA state resource needs report gives a preview of the kinds of concerns that we're now seeing. There simply must be a sufficient number of state staff in place to make all this happen and meet expectations. Connecticut is now focused more on LCR than has been the case in the past; but it comes at a cost and means drawing folks away from other project areas. Swallow observed that state priorities are fundamentally driven by trying to do the right thing based on protecting public health and evaluating risk. Grevatt expressed appreciation for both of the preceding points.

State Responses to Letter so Governors and Commissioners: Grevatt noted that every state responded to the February 29th letters and confirmed that they're implementing all current guidances. Many states have also taken innovative approaches that EPA would like to see shared among all states. But, the Agency remains concerned about the status of materials inventories in many systems across the country and those systems' approaches to identification of Tier 1 sites. This has clearly been a struggle for many systems. In response to a question, Grevatt noted that the most recent (July 6th) letters to states are not tailored or state-specific. Godreau asked whether there are more deadlines that the Agency plans to impose. Grevatt said no, but characterized the recent letters as a request of states to follow up more broadly. Sokol asked whether EPA Regions are being asked to reach out. Grevatt responded that Regions have indeed been asked by EPA-HQ to reach out and talk about the letters as well as to work with their states on implementation of the LCR. It'll be at least five years before a new LCR is promulgated, so the Agency believes it's important to continue to implement the existing rule as best we collectively can, in the interim. EPA will continue to take the "spreadsheet" route to LALEs in the interim. EPA will also be doing additional trainings in LCR implementation. Grevatt highlighted the OCCT guidance and noted that appropriate identification of Tier 1 sites will be a continuing area of particular focus. Regarding 3Ts guidance, Grevatt said that EPA hasn't yet decided about whether or not to update it. But, in any case, they're making schools a particular area of focus. Messer expressed the view that the guidance needed to be updated; especially, for instance, the use of 20 ug/L as a *de facto* action level. Mathieu suggested that some strategic updating of the document was warranted. *[Editorial Note: Officials in OGWDW-SRMD* *confirmed, after this call, that some strategic revisions and explanations relative to the 3Ts guidance are currently underway with a fall 2016 target date for completion; full revision will need to await the revised final LCR.].* Daniels noted that the media is calling into question the validity of LCR data as well as approaches that states have recommended to systems as guidance. At the end of the day, it's hard to enforce against systems that don't follow guidances (i.e., only rules are fully enforceable). Grevatt appreciated the concern. EPA will continue to advocate best practices. Godreau noted there have been overall reductions in blood lead levels over the history of the rule and overarching successes in lead reduction. EPA has been trying to get out some of this message; but, it's an uphill battle, in terms of getting the press to pay attention.

Other Hot Topics Update:

PFOA/PFOS: Forbes noted that a "full court press" was put on 10 California water systems (13 sources) by EPA Region 9; treating the PFCs as an acute contaminant risk. Burneson observed that, because of the critical life stage threat, messaging to individuals in those critical stages be considered – and that alternative sources of water be evaluated. EPA is urging action, in a longer term frame, for the rest of the population. Ellingboe noted the considerable challenges of framing a simple message and getting it out, as quickly as possible. We collectively need clear, succinct messages. Burneson pointed out the limitations of the Health Advisories for PFOA/PFOS and agreed that we collectively need to consider what more to provide, in the future, by way of public messaging. Godreau indicated that the Regions were tracking the implementation of the PFC HAs in much the same way as systems with lead exceedances. Such an approach for HAs seems unprecedented. Messer noted that there's also a question about some past HAs and the public's expectations regarding them. Burneson will send a link to a table that provides information about all HAs issued to date. Godreau noted that there's also an interest in getting any available information about acute levels for chronic contaminants. Burneson explained that the table he'll send will have some duration information that may be helpful in that regard. Several Board members noted that states grapple with the question of how much of a priority should be placed on monitoring for some of the contaminants that are not on the UCMR; there's also the issue of lower detection levels for some of the UCMR contaminants – and, public expectations surrounding these.

Legionella: Burneson explained that the draft treatment technologies evaluation document is out for comment and was the subject of stakeholder meetings in the fall of 2015. The Agency is now in the middle of peer review of the document. They plan to share those comments soon with the state-EPA workgroup. Daniels said that her state has been sharing information on *Legionella* on ASDWA's web site. They're issuing permits, on a case by case basis, and, have a hospital that has recently experienced an outbreak.

HAs for Cyanotoxins: Burneson explained that EPA has been working on model cyanotoxin management plans involving partnering with five water systems across the country. They've done site visits to all and expect to have model plans by the fall. They have also done workshops in Regions 5, 8, and 10 and are working on risk communication tools that could be a model for other HAs. They hope to have these out in the next year or so. There was a HABs meeting in Chicago recently and they've appreciated state input at these various workshops. Messer explained that Ohio's cynatoxins rule went into effect on June 1st. The state has also engaged in collaborative work with AWWA on comparative methods studies. They expect to have the findings of these comparisons available later this summer.

PWSS/DWSRF Program Implementation Issues:

Data Management: Bergman explained that the Compliance Monitoring Date Portal will be rolled out in September 2016. They've been piloting it with a number of states. Regarding Prime, the Agency plans to roll out Prime-core by October 2017. They need to establish a common understanding with states of what would be in that version. It would have all of the components of the LCR and RTCR; but, in an environment that states can test and move data into. It will also have reporting capabilities. The Agency is currently working on prototyping and hope to have portions of Prime available soon for states to begin to look at very soon. The full version of Prime should be available in March 2018.

WIFIA: Corr explained that, regarding the right of first engagement (wherein prospective WIFIA projects must first be considered by the SRF program), EPA can't force anyone to take a WIFIA or an SRF loan. EPA wants the WIFIA-SRF engagement process to be constructive. A state-EPA discussion group has recently explored how SRF programs could get a jump on the 60 day clock (i.e., the statutory timeframe for the engagement process to be completed); such as using letters of intent to apply as the first information provided to an SRF program -- with a formal application to follow. EPA's WIFIA program officials would plan to share information with their state SRF program counterparts, regarding whether or not an applicant chooses to proceed with a WIFIA loan. This early consultation process would be an opportunity for state SRF program officials to market the SRF program to applicants. Mathieu asked about EPA's plans to market the WIFIA program. Corr explained that there is no funding for loans now; so, they're not yet at the marketing stage; however, they will soon propose a rule. Mathieu expressed some concerns about the competition posed by the WIFIA program to the SRF program and asked that EPA's WIFIA program officials *not* convey the message that state SRF programs can't handle large projects (which has been a talking point, in the past, used by some of the WIFIA proponents in the water utility community). Corr expressed appreciation for these points.

Appointment

From: Ross, David P [ross.davidp@epa.gov]
Sent: 6/26/2018 12:13:30 PM
To: Ross, David P [ross.davidp@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]; Forsgren, Lee [Forsgren.Lee@epa.gov]; aroberson@asdwa.org; Mclain, Jennifer [Mclain.Jennifer@epa.gov]
CC: Campbell, Ann [Campbell.Ann@epa.gov]; Penman, Crystal [Penman.Crystal@epa.gov]

Subject: Meeting with ASDWA Conference Ex. 6 Personal Privacy (PP)
Attachments: Real ID Information.pdf; ASDWA PFAS - letter to EPA and CDC - Final 01122018.pdf; FInal LT_LCR Federal Consultation ASDWA Comments_Appendices.pdf
Location: 1201 Constitution Ave NW, Washington DC 20460; WJCE 3233; Please call 202-564-5700 for escort

Start: 6/26/2018 8:00:00 PM
End: 6/26/2018 8:30:00 PM
Show Time As: Busy

1. Funding for the states
2. The revisions to the Lead and Copper Rule and our desire to have an ongoing dialogue with EPA (enclosed are our recent Cooperative Federalism comments)
3. PFAS and our desire to have EPA play a leadership role (enclosed is our earlier PFAS letter to EPA)

J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
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ASDWA

Association of State Drinking Water Administrators

January 12, 2018

Mr. Scott Pruitt, Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

Dr. Brenda Fitzgerald, Director
Centers for Disease Control and Prevention
and Administrator, ATSDR
1600 Clifton Road Atlanta, GA 30329-4027

Subject: State Drinking Water Program Recommendations to EPA and CDC on PFAS

Dear Administrator Pruitt and Director Fitzgerald:

The Association of State Drinking Water Administrators (ASDWA), which represents the 50 states, five territories, the Navajo Nation and the District of Columbia has serious concerns with the growing public health issues associated with Per- and Polyfluoroalkyl Substances (PFAS) in drinking water. ASDWA's members regulate and provide technical assistance and funding for the nation's 160,000 public water systems (PWS), and coordinate with multiple partners to ensure safe drinking water for our nation's 324 million residents.

ASDWA urges EPA and CDC to work in partnership with ASDWA and state drinking water programs, and with the Department of Defense (DoD) to address these growing public health concerns. Our primary recommendation is that a working committee be formed with ASDWA, EPA, CDC, and DoD leadership to work on the list of specific recommendations attached. Given the potential adverse public health implications from PFAS, ASDWA recommends that this group be established as soon as possible.

ASDWA's second urgent recommendation, following the development of a working committee of the pertinent agencies, is for the federal government to develop a unified message to the public and state regulators on what to do about PFAS, and to work in unison with other stakeholders, and in a timely manner, to minimize the potential adverse effects to public health and the environment from PFAS. Knowledge is continually evolving on a wide range of PFAS issues, and this new knowledge needs to be transferred to the public and state regulators in a coherent and cogent manner. Without this unified message and information, we're concerned that several sets of differing risk numbers will be communicated from each agency, which will cause confusion, delay, or worse, no action at all.

For example, three states (Minnesota, New Jersey, and Vermont) have proposed or established PFAS standards or guidelines that are lower than EPA's Health Advisories (HAs). These differences among states demonstrate the difficulty in calculating health risk goals and determining risk reductions without federal standards, and are creating public confusion about what levels of PFAS are safe in drinking water. In addition, EPA's FAQ document and HAs for PFOA and PFOS are unclear on PWS actions for susceptible populations which is causing some states to recommend that water systems issue "do not drink" public notices, while other states are interpreting EPA's HAs to recommend that water systems provide public notice without any explicit actions.

When EPA's 2016 HAs for PFOA and PFOS were combined with the occurrence data from the Third Unregulated Contaminant Monitoring Rule (UCMR3), state drinking water program administrators had to determine how to handle all the information on their own. The result has been some confusion on appropriate actions and a lack of consistent responses from state to state. As the number of PFAS compounds and PFAS contaminated sites continues to grow, so will the complexity and urgency of this problem.

ASDWA and its members provide the enclosed table of recommendations for your respective agencies to implement to address our states' drinking water program challenges that are summarized below:

- Directly engage with states in the development of any new PFAS guidelines, health advisories (HAs), or minimum risk levels, and support current state efforts to ensure the ability of states to assess and address PFAS and the consistency of actions across states.
- Directly engage with states to develop guidance for PWS with clear recommendations to ensure more consistent response actions and protocols, explain the associated health risks with PFAS, and provide clear direction for consumers to reduce their risk from PFAS in drinking water and other identified pathways.
- Conduct more health effects research and develop consistent health effects determinations (risk levels) for known and unknown PFAS.
- Increase funding and support for non-targeted analyses of drinking water for PFAS and substitute compounds to ensure that any potential adverse impacts of new chemicals on groundwater and surface water are identified, and the associated health risks are understood.
- Develop rules or guidance to prevent PFAS from contaminating drinking water through other media (i.e., underground injection control, soil leaching, deposition from air emissions, and wastewater discharges).
- Directly engage with stakeholders and industry to assess and address the universe of known and unknown PFAS compounds that are being used and evaluate fire-fighting foam alternatives, to provide a knowledge base to state media programs for development of guidance and regulations, and to protect drinking water at the source.
- Consider bias and error in analytical methods and develop additional analytical methods for drinking water and other media, develop standards for branched and linear isomers, coordinate with lab vendors, develop guidance for standardization of lab results for PFAS analytes (i.e., acid form and/or different salt forms), and increase lab programs and capacity beyond UCMR3.

Resources for state drinking water programs that address PFAS contamination, in addition to traditional compliance oversight and enforcement for the Safe Drinking Water Act (SDWA) regulations, are already stretched thin. Your leadership in convening these agencies toward a unified solution and message is vitally and urgently needed. Thank you for your consideration of these recommendations. We look forward to discussing them in greater detail and to continue to coordinate with you on efforts to address PFAS in drinking water. If you have questions about these recommendations, please feel free to contact me at ldaniels@pa.gov or contact Alan Roberson, ASDWA's Executive Director at aroberson@asdwa.org .

Sincerely,

Lisa Daniels, ASDWA President and Director, Bureau of Safe Drinking Water Director,
Pennsylvania Department of Environmental Protection

cc: Maureen Sullivan, DoD

ASDWA Recommendations for EPA and CDC to Address State Drinking Water Program Challenges			
Topic	**ASDWA RECOMMENDATIONS EPA AND CDC MUST DEVELOP AND SUPPORT:**	**Associated Challenges**	**Purpose**
States	**Direct engagement with states to develop any new PFAS guidelines, health advisories, or standards**	States have historically relied on EPA to develop standards and most states do not have the expertise to assess and address PFAS, though a few states have developed differing PFAS action levels	To ensure the ability of states to address PFAS and the consistency of actions across states
	Considerations for PFAS as an unfunded mandate	PFAS has added a significant state burden beyond existing SDWA requirements	To ensure the ability of states to address PFAS
PWSs	**Direct engagement with states to develop PWS guidance with:** • **Clear recommendations and actions for pregnant women, infants, and other sensitive subpopulations (public notice versus "do not drink")** • **Health risk messaging, including other possible exposure routes and mitigation options**	• There is a lack of federal leadership to ensure consistent state, PWS and public response actions and protocols and explain the associated health risks • EPA's HA and FAQ documents are unclear on actions a PWS can take to help public consumers respond to health advisories	• To ensure consistency between different federal and EPA programs • To provide clarity for decision making processes and actions • To reduce public confusion
Health Risks	• **More health effects research on all PFAS compounds** • **Consistency between EPA health advisory levels and CDC minimum risk levels (MRLs)**	• Different states have set different health advisory levels and standards due to differing opinions among federal and state toxicologists • States are finding more PFAS compounds in source waters that may pose health risks	• To avoid disparities and changes in future decision-making processes • To alleviate confusion by states, PWSs, and the public
Research and Development	**Increased funding and support for EPA's Office of Research and Development laboratories for non-targeted analyses of drinking water for PFAS and substitute compounds**	• Only 20 to 30 of the thousands of PFAS compounds can be analyzed by commercial laboratories • New substitutes for PFAS and associated breakdown products are not fully understood	To ensure that the potential adverse impacts to groundwater and surface water from new chemicals are understood and that drinking water is protected
Underground Injection Control	**Specific guidance on under SDWA 40 CFR 144.12(a) on the authority to prohibit PFAS discharges into underground sources of drinking water that "may otherwise adversely affect the health of persons"**	PFAS used in industrial and commercial settings are being discharged in large quantities to the groundwater via shallow subsurface systems under the Class V UIC program	To prevent the contamination of drinking water and the environment

Topic	ASDWA RECOMMENDATIONS EPA AND CDC MUST DEVELOP AND SUPPORT:	Associated Challenges	Purpose
Soil Leaching Standards	**Guidance for bio-solids on maximum PFAS concentrations that will protect drinking water**	Biosolids containing PFAS can contaminate drinking water in source water protection areas	To protect drinking water quality
Air Emissions	**Assess the Clean Air Act for developing guidance or a rule aimed at preventing air emissions from contaminating drinking water with PFAS**	Air emissions at sites in multiple states have contaminated the public and private drinking water supplies of tens of thousands of people	To protect drinking water quality
Wastewater Discharges	**Assess the Clean Water Act for developing guidance or a rule aimed at preventing wastewater discharges from contaminating drinking water with PFAS**	Wastewater discharges at sites in multiple states have contaminated the public and private drinking water supplies of hundreds of thousands of people	To address PFAS compounds at the source and protect drinking water quality
Source Water Protection/ Source Control	**Convening a group of relevant stakeholders and industry to:** • **Include PFAS contents in product labeling** • **Identify current use of PFAS and non-PFAS products that replaced legacy compounds** • **Evaluate fire-fighting foam and alternatives that will be less likely to impact drinking water**	• It is difficult to assess the fate and transport and toxicity to human health and the environment without knowing which PFAS and other substitute compounds are being used • Fire-fighting foam has contaminated the drinking water supplies of many PWSs	To proactively and directly engage with PFAS manufacturers and sellers of PFAS products to assess and address the universe of PFAS compounds being used and protect drinking water
Laboratories and Sampling	**Efforts to ensure that all future HAs, guidance or standards explicitly include anticipated bias and error in drinking water analytical methods**	Errors in lab results have led to incorrect determinations for health advisory level exceedances and associated response actions	To ensure accurate results and associated state and PWS response
	Additional PFAS analytical methods for drinking water, wastewater, and other media	It is difficult to determine the source of PFAS and require generators to limit discharges	To investigate and address PFAS compounds at the source
	Development of lab/standard grade PFAS standards that contain branched and linear isomers	Available lab standards do not include branched isomers for some PFAS compounds	To clarify isomer identification and differentiation
	Coordination with manufactures to ensure standards are consistent from one vendor to another	Certified standards from different vendors differ by as much as 20%	To ensure consistency among vendors
	Guidance for standardization of laboratory results	Acid forms and/or different salt forms of PFAS analytes are incorrectly listed and reported	To ensure accuracy, clarity, and consistency of sample results
	Ongoing laboratory programs, capacity, and sampling efforts to assess PFAS compounds at lower detection limits and in targeted smaller communities not included in UCMR3	• Lab accreditation is not supported after the UCMR • States are finding more PFAS compounds in source waters at lower detection limits and in smaller communities	To ensure lab capacity to assess and address the occurrence of all PFAS compounds beyond the UCMR3

March 8, 2018

Mr. Scott Pruitt, Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

Subject: State Drinking Water Program Comments on Long-Term Revisions to the Lead and Copper Rule (LT-LCR)

Dear Administrator Pruitt:

The Association of State Drinking Water Administrators (ASDWA) appreciates the opportunity to provide additional input on potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR). ASDWA is the professional association that serves the 57 men and women (and their staff) who lead and implement state and territorial drinking water programs. ASDWA has become a respected voice for state primacy agencies with Congress, the Environmental Protection Agency (EPA), and other professional organizations. Our members are co-regulators with EPA for the National Primary Drinking Water Regulations (NPDWRs), so our recommendations for the LT-LCR are based on many years of implementation experience.

ASDWA's members have been implementing the current Lead and Copper Rule (LCR) since it was originally published in 1991, as well as the minor revisions in 2000 and 2004, and the short-term revisions in 2007. As such, our members have a breadth and depth of knowledge on this topic that's likely greater than any other group from which EPA will receive comments. Our members' comments contain several important recommendations that we hope EPA will thoughtfully consider during its discussion of potential regulatory options.

The goal for the LT-LCR is simple – reduce lead exposure from drinking water and increase public health protection. From our perspective, the regulatory approach to reach this goal is:

- Targeting more stringent regulatory requirements where they are needed most;
- Closing the "loopholes" in the current LCR; and
- Simplifying the regulatory requirements, so that water systems, state primacy agencies, technical assistance providers, contract operators, and anyone else working to provide safe drinking water can read and understand them.

In our comments you will find 7 major recommendations for EPA:

1. Keep as many components of the current LCR as possible (if they are protective of public health) for the monitoring and sampling site selection framework because water systems, state primacy agencies, technical assistance providers, and contract operators already know them.
2. Consider using a "bins" regulatory framework for the rule with progressively more stringent "bins" with required actions by water systems based on increasing levels of the 90th percentile of lead samples from 1-liter first draw tap samples.

3. Apply a holistic approach that takes into consideration simultaneous compliance with all drinking water regulations, as well as with regulations for wastewater discharges.
4. Be the leader with all federal agencies in reducing total lead exposure, not just from drinking water, and look beyond drinking water regulations to reduce public exposure to lead.
5. Support Americans with lead service lines, with public education and programs that promote cooperative funding, so that all homeowners, no matter their income or location, can afford to replace them.
6. Assure all educational materials about reducing exposure to lead are consistent across all agencies and are fully transparent.
7. Be careful in how much flexibility is allowed under the LT-LCR. Too much flexibility can adversely impact rule implementation, create unintended "loopholes", and ultimately lead to delays in achieving the intended results. States generally prefer flexibility for a limited number of strategic regulatory components where states need to able to tailor regulatory requirements to local conditions.

ASDWA urges EPA to be mindful that the LT-LCR will have a significant impact on state workloads – our estimates are more than 730,000 hours annually – and state budgets. ASDWA has developed a detailed Costs of States' Transaction Study (CoSTS) that estimates an additional burden of $73-$97 million annually for states, depending on the regulatory option selected. Given the states' ongoing challenges in meeting EPA's requirements for the existing drinking water regulations, this is a significant increase. This potential increase exacerbates the gradual erosion of federal funding from the Public Water System Supervision (PWSS) program from $105 million in FY 10 to $102 million for the past four fiscal years (FY 14 to FY 17).

Additionally, the LT-LCR could potentially impact the funding from the Drinking Water State Revolving Loan Fund (DWSRF) as more water systems move forward with the installation of corrosion control treatment (CCT) and lead service line replacement (LSLR). The funding for this additional treatment and construction needs to be considered in EPA's Drinking Water Needs Survey, and the funding for the DWSRF increased accordingly.

Phasing in some of the regulatory requirements based on system size will likely be necessary, such as staggered compliance deadlines, which would be comparable to the implementation approach for other drinking water regulations in the past.

On behalf of the 57 states, territories and tribes we represent and the 150,000 drinking water systems they oversee, which serve 300 million Americans, we thank you for the opportunity to provide this input on the LT-LCR. If you have any questions about these comments, please feel free to contact me at ldaniels@pa.gov or Alan Roberson, ASDWA's Executive Director at aroberson@asdwa.org.

Sincerely,

Lisa D. Daniels

Lisa Daniels, ASDWA President

cc: Andrew Hanson – EPA OCIR
Peter Grevatt – EPA OGWDW
Eric Burneson – EPA OGWDW

Comments by the Association of State Drinking Water Administrators (ASDWA)
For the Lead and Copper Rule (LCR) Federalism Consultation
Docket ID No. EPA-HQ-OW-2018-0007

General

The Association of State Drinking Water Administrators (ASDWA) appreciates the opportunity to provide additional input on potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR). ASDWA is the professional association that serves the 57 men and women (and their staff) who lead and implement state and territorial drinking water programs. Formed in 1984 to address a growing need for state administrators to have national representation, ASDWA has become a respected voice for state primacy agencies with Congress, the Environmental Protection Agency (EPA), and other professional organizations. ASDWA's members are co-regulators with EPA for the National Primary Drinking Water Regulations (NPDWRs), so our recommendations for the LT-LCR are based on many years of implementation experience.

ASDWA's members have been implementing the current LCR since it was originally published in 1991, as well as the minor revisions in 2000 and 2004, and the short-term revisions in 2007. As such, ASDWA's members have a breadth and depth of knowledge on the details of LCR implementation that EPA needs to incorporate into the LT-LCR. ASDWA's members have recently gained additional regulatory experience post-Flint by taking actions such as reviewing materials and lead service line (LSL) inventories, corrosion control treatment (CCT) and water quality parameter (WQP) monitoring that go beyond the regulatory requirements of the 1991 LCR. As rule development continues, ASDWA, as co-regulators with EPA, would like to continue to collaborate with EPA. These comments contain several important recommendations (such as the "bins" regulatory framework detailed below) that EPA needs to thoughtfully consider during its discussions and deliberations on potential regulatory options for the final LT-LCR.

The goal for the LT-LCR is simple – to reduce lead exposure from drinking water and thereby increase public health protection. Considerable progress has been made since the 1991 LCR in reducing the national aggregate 90th percentile as detailed in Figure 1 of the Brown, et al, paper (*Jour. AWWA 105:5:62)*. For approximately 150 of the water systems serving >50,000 people, the median of their 90th percentiles decreased from 20-25 µg/L to 6 µg/L between 1992-93 and 2000. For the higher exposures, the 95th percentile decreased from 80 µg/L to 17 µg/L. Notwithstanding the occasional outliers, the considerable progress made in understanding corrosion control and in reducing lead in drinking water should be recognized and the lead regulation strengthened to minimize the potential for additional outliers. While everyone can agree on the above goal, the optimal processes to achieve that goal vary, depending on perspective.

From the perspective of state primacy agencies, ASDWA's goal for the LT-LCR is to continue to protect public health by

- Targeting more stringent regulatory requirements where they are needed most;
- Closing the "loopholes" in the current LCR; and

- Simplifying the regulatory requirements, so that water systems, state primacy agencies, consulting engineers, technical assistance providers, contract operators, and anyone else working to provide safe drinking water can read and understand them.

The current LCR is one of the most complex drinking water regulation with lots of moving parts, and many potential regulatory changes have been discussed and debated for the past 15-20 years. One method for simplification is to keep as many components of the existing LCR as possible (if they are protective of public health) for the monitoring and sampling site selection framework that water systems, state primacy agencies, consulting engineers, technical assistance providers, and contract operators already know. Any change to the LCR will require substantial training and technical assistance, so minimizing unnecessary changes should be a goal for the LT-LCR.

ASDWA's recommendations and comments on the LT-LCR go beyond the questions in the five categories presented at the January 8th Federalism Consultation Meeting. ASDWA's comments provide an overall regulatory approach using "bins" (detailed below) with a progressively more stringent regulatory framework based on increasing levels of the 90th percentile of lead samples for 1-liter first draw tap samples. Additionally, these comments should be the starting point for additional dialogue between ASDWA's members (as co-regulators) and EPA, with additional discussions on the LT-LCR between March 8th and the publication of the proposed rule.

ASDWA recommends that EPA take a holistic regulatory approach for the LT-LCR that takes into consideration simultaneous compliance with all drinking water regulations, as well as with regulations for wastewater discharges. For example, in the past, some water systems changed their residual disinfectant from chlorine to chloramine without appropriately considering changes in water chemistry that subsequently resulted in an LCR Action Level Exceedance (ALE), e.g., the Washington, DC, problems in the early 2000s. For wastewater dischargers, the addition of a phosphate-based corrosion control inhibitor could result in a violation of their National Pollution Discharge Elimination System (NPDES) permit and/or the required installation of additional nutrient removal treatment to meet increasingly stringent nutrient discharge requirements. It would be prudent for EPA to consider making a realistic assessment of Clean Water Act (CWA) implications if the agency considers mandating the addition of phosphate-based corrosion inhibitors in the LT-LCR.

EPA should take the lead with all federal agencies in reducing total lead exposure, not just from drinking water, as part of this holistic approach. EPA Administrator Pruitt's recent invitation to members of the President's Task Force on Environmental Health Risks and Safety Risks to Children to participate in a Principals Meeting to discuss next steps in developing a federal strategy to reduce childhood lead exposure and eliminate associated health impacts is a step in the right direction. Consistent and timely follow-up actions to this initial meeting are needed. As part of the LT-LCR, EPA should consider what actions the Centers for Disease Control and Prevention (CDC) and other agencies are taking to reduce exposure to lead so that all involved are sending a consistent message. All federal agencies must agree on what actions homeowners and tenants should be taking.

Additionally, expecting the LT-LCR to single-handedly address lead exposure through a more stringent drinking water regulation is unrealistic. Considerable progress in reducing total exposure to lead has been made through the lead ban in gasoline, mitigation in homes with lead paint, the ban of lead solder, corrosion control in drinking water and the further reduction of allowable lead in plumbing materials from the Reduction of Lead in Drinking Water Act of 2011 (P.L. 111-380). Consistent and timely actions are needed for all routes of exposure – lead in paint, lead in dust and lead in drinking water. Some routes of exposure, such as paint and dust, can be effectively addressed through EPA offices outside of the Office of Water (OW) and through the expansion of healthy homes initiatives and lead reduction initiatives in other federal agencies. Again, EPA needs to take the lead with all federal agencies in reducing total lead exposure.

The public plays a key role in reducing total lead exposure, as, dependent on the local situation, homeowners and tenants can take actions to reduce their lead exposure. For homes with lead service lines, addressing lead is a shared responsibility between customers and public water systems since lead service lines exist on both public property (rights-of-way or easements) and private property. The LT-LCR should adequately support appropriate actions by both the customers and public water systems.

It is critical that all entities involved are fully transparent and deliver consistent information to the public. Educational materials must provide consistent and precise guidelines so that customers take the appropriate actions. A significant effort will be needed by EPA to develop the appropriate educational and outreach materials as part of the LT-LCR.

Balancing regulatory flexibility and ease of implementation is always challenging in the regulatory development process. Traditional numerical Maximum Contaminant Levels (MCLs) are easy to implement, as compliance is simply a case of comparing one number to another number. Regulatory flexibility allows states to address local needs and circumstances, but it takes more time for states to implement. Additionally, too much flexibility can create confusion, inconsistency and unintended "loopholes" and may mean that critical issues for protecting public health might not get recognized and resolved. ASDWA recommends there be limited flexibility in the LT-LCR for a limited number of strategic regulatory components. Too much flexibility in the LT-LCR would be problematic for states.

No matter what regulatory option is ultimately selected, the LT-LCR will lead to an increased workload for states. States' actions will include the tracking and oversight of new monitoring and reporting requirements, review and approval of new or updated plans and reports, additional follow-up actions, additional training and technical assistance, and compliance and enforcement. ASDWA has developed a detailed Costs of States' Transaction Study (CoSTS) that estimates that the national total hours for state staff time during the first cycle (the first 5 years) of implementation of the LT-LCR will be in the range of 3.7-4.9 million hours, or 730,000-970,000 hours of labor annually for 49 states (Wyoming doesn't have primacy). Assuming a loaded (direct and indirect costs) hourly rate of $100 for a staff engineer, this translates to an additional burden of $73-$97 million annually for states. Given the states' ongoing challenges in meeting EPA's requirements for the existing drinking water regulations, this is a significant increase. This potential increase exacerbates the gradual erosion of federal funding from the Public Water System Supervision (PWSS) program from $105 million in FY 10 to $102 million for the past four fiscal years (FY 14 to FY 17). Inflation over the past decade further exacerbates the funding gap. A narrative on the development of these estimated costs and the detailed spreadsheets for CoSTS are attached as Appendix A to these comments.

State drinking water programs have been chronically underfunded, on top of this gradual erosion of PWSS funding. ASDWA's 2013 state drinking water resource needs report estimated the funding gap of $240 million for a minimum based program, and $308 million for a comprehensive program that includes additional activities undertaken by states to achieve the public health protection vision and goals established by the SDWA. This report was a collaboration between EPA and ASDWA, using EPA's contractor (Cadmus) to collect the data (that was then validated by the states) and then generate the report. The summary recommendations from this report are enclosed as Appendix B to these comments.

Regardless of the regulatory option selected, the LT-LCR will have a high initial workload for states for developing their primacy package, tracking and reviewing materials and lead service line inventories, tracking and reviewing monitoring plans, training and technical assistance for water systems and technical assistance providers, etc. Each component of the LT-LCR will require a significant increase in state staff time.

One component ("regulatory start-up") can be validated by comparing the LT-LCR to the 2013 Revised Total Coliform Rule. The workload from the RTCR "regulatory start-up" was significant. ASDWA's estimate for the LT-LCR start-up effort is more than 500,000 hours of state staff time, which is in the range of the estimated start-up for the 2013 RTCR that was developed for ASDWA's 2013 national estimate of the resources needed for state staff time for all components of their drinking water programs.

Training is another regulatory component that warrants some additional discussion, as the drinking water community does not have technical capacity to implement a revised LCR. Technical capacity for determining and maintaining Corrosion Control Treatment (CCT) and developing appropriate monitoring plans for water quality parameters (WQP) ramped up after the 1991 LCR but has since decreased due to state staff turnover/retirements and a lack of funding. There is simply not enough capacity with the states, water systems, consulting engineers, academics, and technical assistance providers to meet all potential regulatory needs for a revised LCR. The number of corrosion control experts in drinking water in the U.S. can be counted on both hands. A joint effort between EPA, ASDWA, and other water associations such as the American Water Works Association (AWWA) will be needed to support the rebuilding of this technical capacity and close coordination on training materials and delivery will be needed. Adequate funding will be needed for the development and delivery of training on the LT-LCR.

Adequate funding for research will also be needed. Many technical issues, such as which corrosion indices to use and/or consider for CCT and when to use coupon testing versus pipe loop studies, will need immediate research funding for successful implementation of the LT-LCR. In this current climate of constrained federal funding, finding the additional funding isn't going to be easy, but it's critical for successful rule implementation and public health protection.

Phasing in some of the regulatory requirements based on system size will likely be necessary, i.e., staggered compliance deadlines, comparable to the implementation approach for other drinking water regulations. There is simply not enough capacity with the states, water systems, consulting engineers and technical assistance providers to meet all potential regulatory deadlines for all water systems at once.

Strengthened Regulatory Framework Using "Bins" Targets Additional Requirements
The LCR Federalism Consultation approach posed some challenges for ASDWA's members (as co-regulators with EPA) in developing substantive comments. As previously mentioned, the current LCR is probably the most complex drinking water regulation with lots of moving parts, and many potential regulatory changes have been discussed and debated for the past 15-20 years.

EPA presented questions on five topics at the initial Federalism Consultation meeting on January 8, 2018. The challenge ASDWA faced was how to connect the topics together in a holistic regulatory framework that shows how each builds and integrates with the other. ASDWA's Board of Directors met this challenge by developing a progressively more stringent regulatory framework based on increasing levels of the 90th percentile of lead samples for 1-liter first draw tap samples. The framework fits the pieces of the regulatory "jigsaw puzzle" together into a holistic approach and targets more stringent regulatory treatment technique requirements where they are needed most. The "bins" regulatory framework is detailed below.

Bin	Lead 90th percentile	Corrosion Control Treatment (CCT)	Lead Service Lines (LSLs)	Water Quality Parameters (WQPs)	PE and Outreach Materials	Tap Sampling
#1	0-5.0 μg/L	Retain current requirements for triggering installation of CCT	Retain current requirements for triggering LSL replacement (LSLR)	Retain current requirements for WQP monitoring for systems with CCT	Provide public education (PE) in Consumer Confidence Report (CCR) & other delivery channels	Retain frequency & triggers in current rule. Allow triennial monitoring
#2	5.0-10.0	Retain current requirements for triggering installation of CCT	Develop LSLR plan & pilot LSLR plan	WQP assessment to evaluate changes in water chemistry	Deliver targeted PE for homes with LSLs	Annual monitoring with standard number of sites. No triennial monitoring
#3	10.0-15.0	Require CCT study that identifies appropriate CCT if Action Level (AL) is exceeded – Implement distribution system find & fix protocol	Implement proactive voluntary LSLR	Increase frequency and number of sampling sites for WQP monitoring. Recommend optimal WQP ranges as part of CCT study	Deliver targeted PE to areas of distribution system based on find and fix	Monitor every six months
#4	>15.0 μg/L	Require CCT	Require implementation of LSLR plan	Require WQP monitoring based on CCT	Deliver broader PE and outreach materials for all	Monitor every six months

Each bin builds upon the previous bin. For example, a system in bin #2 must comply with the regulatory requirements in both bins #1 and #2. A system in bin #3 must comply with the regulatory requirements in bins #1, #2, and #3. A system in bin #4 must comply with all the requirements in all bins.

This framework eliminates several "loopholes" in the current rent. For example, water systems would not be able to sample repeatedly at sites with low lead levels to reduce their 90th percentile. Systems would not be able to sample from sub-optimal sites based on outdated information, i.e., for systems with a blend of LSL and non-LSL homes, all compliance sampling locations would need to be at LSL homes.

This framework also has some details that warrant further discussions and deliberations. For example, some of the above components will need an "anti-backsliding" approach, such as corrosion control treatment (CCT). Once CCT is initiated, it should be considered a permanent installation and not suspended when 90th percentiles decline. Further discussion between EPA and ASDWA (as co-regulators) is also needed on how much existing data (grandfathering) could be used for initial bin placement.

This regulatory framework parallels other NPDWRs, such as the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and prioritizes regulatory actions for systems that have higher 90th percentiles, thereby increasing public health protection in a timely manner. It also recognizes and allows water systems in the lowest bin (bin #1 with a 90th percentile of 0-5.0 μg/L) to maintain their present actions. Water systems in the lowest bin would not be required to make the investment to replace lead service lines (LSLs) when the inherent water chemistry or corrosion control is working and a sufficient scale inside the pipe has been formed to minimize lead exposure. The framework is proactive in that if a system is in bin #3 (10.0-15.0 μg/L), steps will be required that would hopefully prevent the systems from exceeding the 15 μg/L Action Level (AL). Finally, this framework encourages systems to strive for a lower bin with less regulatory requirements that would ultimately lead to increased public health protection.

The assessment in bin #2 should include an evaluation of more frequent lead and water quality parameter (WQP) monitoring, the WQP operational range, more representative locations, the potential need for additional WQP parameters such as dissolved inorganic carbon (DIC), etc. ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed assessment.

The broader public education and outreach effort in bin #4 should include increased frequency, targeted delivery, good faith effort to reach renters, and partnerships with schools and day care centers and local health agencies. Again, ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed outreach effort. The Lead Service Line Replacement Collaborative, of which ASDWA is a member, would provide a forum for development and distribution of the broader public education and outreach materials. Additionally, EPA needs to take the lead with all federal agencies in reducing total lead exposure and the distribution of such materials to others that need them besides states and water systems, such as the Department of Education for schools and the Department of Health and Human Services (HHS) for childcare facilities and local health agencies.

Lead Service Lines (LSLs)

ASDWA believes that, as a goal, the only way that lead exposure can be eliminated in drinking water is if lead can be completely removed from contact with the water. This is our public health goal, and the LT-LCR should help us move in that direction. However, the TL-LCR must also be cost effective and have a reasonable expectation that water systems can comply. Setting unrealistic expectations, for example, considering the initial accuracy of lead service line (LSL) inventories, reaching 100% LSL removal of both the public and private sides within a short timeframe, regardless of the cost, just sets states and water systems up for failure and will continue to degrade public confidence in drinking water. The bin approach previously discussed should not prevent water systems or communities from proactively removing LSLs (both public and private sides) and ASDWA supports these voluntary efforts.

Lead service lines (LSLs) may be the largest contributor of lead in drinking water in systems with LSLs, but LSLs are not the only source of lead. Many water systems do not have (or don't currently think that they have) any LSLs. Therefore, the regulation can't focus exclusively on LSLs but must address other lead sources such as lead solder, plumbing fixtures, galvanized pipes, etc., that also contribute to the lead action level and lead exposure in general. The rule must also recognize that the largest lead contribution is probably not on the public side but likely originates in the customer's own lead service line (private side) and in their plumbing. ASDWA favors an approach, like our suggestion for using bins, to holistically address lead in drinking water under the rule. Lead service line replacement (LSLR) should be covered in LT-LCR but is also something for which EPA should seek collaboration with other federal agencies and interested groups outside government, especially for supporting LSLR on the private side.

ASDWA believes the cost of lead service line replacement (both public and private side) is too great to be mandated for water systems in the LT-LCR. Water systems can and should take steps to promote and facilitate full removal of lead service lines, as noted in our bin table, and appropriate rule requirements can make this happen. However, the only way to realistically remove the complete lead service line involves active home-owner participation. Many homeowners will not be able to pay for removing the portion of the line they own. Funding for this effort will need to be provided through a collaborative and cooperative approach involving a variety of stakeholders, both public and private. As previously mentioned, the Lead Service Line Replacement Collaborative provides a notable example of how groups can come together to help solve this problem. Also, some actions to reduce LSLs on the private side are outside the scope of the LCR, and EPA should be working with other agencies to encourage responsible actions by homeowners. This includes efforts such as notification to purchasers about lead pipes in homes at the point of sale, expanding access to lead remediation funding for LSL replacement, and other similar measures.

A complete inventory of lead in the water system (outside the home) is essential to support lead service line replacement (LSLR) and is also critical information for determining appropriate sample locations and advising the customer on how to reduce lead exposure. The data in the materials inventory also helps drive the decisions in our bin approach. The rule should require the water system to develop a complete materials inventory of the entire distribution system and submit the inventory to states for review and approval. The inventory must address both public and private side LSLs, as well as lead goosenecks used to connect the service line to the water main, to provide adequate information to drive action. This inventory will have to evolve over time, as more data and information about the distribution system becomes available through water main replacement and LSLR.

For compliance with the 1991 LCR, many systems only conducted a partial materials inventory to find the required number of tier 1 sample sites. This level of effort was not sufficient to prepare them to identify replacement sites as customers dropped out. A new or updated materials inventory under the LT-LCR must be completed. It was not clear under the current rule whether the materials inventory had to be submitted to the state, so therefore, most were not. Under the revised rule, states will expect to receive, review and approve all materials inventories for completeness. ASDWA recognizes that this will be a significant effort for both water systems and states, but the effort needs to be undertaken. ASDWA recommends that failure to complete an appropriate inventory be a violation.

Developing the inventory will be challenging. A completely accurate inventory is nearly impossible to create since local records are incomplete or non-existent. Research is underway to develop more tools, but at this point, systems will need to use the best information that can be found. Where reliable data is not available, estimates may need to be made for both private and public lines using housing age, local ordinances, and other relevant factors. The homeowners can play a role in documenting private side service lines, and water systems should reach out to the homeowners to determine if they have more information about their service line. EPA should provide detailed guidance for developing the inventories.

Plumbers can play a role if they are provided with training and guidance on identifying lead service lines. Information for plumbers should be a part of the basic educational material that EPA develops for the LT-LCR. EPA should develop estimated costs for plumbers to conduct a lead service line evaluation, so educational material for customers can include these costs should a homeowner want to know with some certainty if they have a LSL (or not).

ASDWA recognizes that any materials inventory is going to evolve, and that the data for some locations (or many locations) will initially be based on best professional judgement, using the history of lead service line installation or other local records. It will be difficult to document, or field verify, all lead service line locations. As such, the inventory will be fluid over time as additional information becomes available from newly discovered records or work in the distribution system. The Lead Service Line Replacement Collaborative has already started collecting best practices for developing inventories, and these best practices need to continue be updated as implementation of the LT-LCR unfolds.

ASDWA recommends that the materials inventory be updated periodically, and the associated compliance monitoring plan adjusted accordingly. The updated inventory could be required to be submitted, reviewed and approved on a mandated frequency, and the frequency could depend on the complexity of the water system, the inventory, and the resources needed for periodic updates. Another option might be to update the inventory along with the monitoring plan before each monitoring cycle begins for the water system.

Preparing a materials inventory, especially one that covers the entire distribution system and includes information for both the private side and the public side will be a significant task for water systems. The review and approval of the inventories will be a significant burden for states. ASDWA recommends some phase-in of this regulatory requirement, starting with large systems and moving to medium and then to small systems over time. States should have the option of accelerating the compliance schedule at their discretion.

In summary, more attention is needed on the materials inventory and compliance monitoring plans by water systems and states, so that states (and the public) can be assured the data are accurate and further actions by water systems based on these data are appropriate. Both are key factors since the "bin" approach relies on 90th percentile values of first draw 1-liter samples.

The LT-LCR should require systems to update their compliance monitoring plans based on the updated materials inventory. The two are linked and one of the failings of the current rule is not fully recognizing the importance of this pairing. Additionally, since ASDWA's goal is total removal of lead, the "testing out" provision for LSLR in the current LCR should be eliminated, regardless of what LSLR regulatory requirements are selected for the LT-LCR.

Distribution of pitcher filters at the time of LSL replacement should not be mandated, although water systems could decide to offer them as an option, in which case, they should be required to make a recommendation on the use of filters in their public education materials. Alternatively, appropriate flushing is effective at reducing lead exposure. A standard flushing protocol should be developed for inclusion in public education and other outreach materials.

Partial LSL replacements are inevitable due to main breaks and emergency repairs. While they can't be totally banned, the rule should encourage water systems to do complete replacement whenever possible and any LSL replacement plan should address this issue. The AWWA Standard C810-17 (Replacement and Flushing for Lead Service Lines) can offer consistency for LSL replacement.

Corrosion Control Treatment (CCT)

Corrosion control plays a key role in the implementation of the LCR, regardless of whether there are lead service lines present or any active LSL replacement program. CCT has significantly reduced lead levels in communities across the U.S. as shown by declining 90th percentile values as detailed in Figure 1 of the Brown, et al. paper (*Jour. AWWA 105:5:62*). ASDWA does not recommend that wholesale changes be made to the CCT requirements, but some CCT requirements can be tweaked and strengthened to make maximum use of this effective tool for reducing lead exposure.

ASDWA recommends that existing CCT be maintained where it is in place, but ASDWA does not support mandating treatment for all water systems. Even under the "bin" approach, water systems with existing CCT must continue CCT. However, adding CCT is a major challenge, especially for small systems and for systems with multiple sources and multiple entry points to the distribution system.

Simultaneous compliance issues must be considered. Installing CCT in small systems where there is no preexisting treatment beyond disinfection may require an operator certification upgrade, additional operational monitoring, and possibly impact compliance with other rule requirements and even influence the community's wastewater discharge. Corrosion control should be installed where it is needed but not where existing water quality is already adequately managing lead. The "bin" approach factors this concept into the "bin" categories, where every size system could require CCT and systems will be increasing their efforts even before there is an Action Level Exceedance (ALE). The approach increases reliance on CCT when it is appropriate to control lead.

A vast amount of data has already been collected under the existing LCR and this information should be used to help determine appropriate CCT for individual systems. Water quality parameter data, 90^{th} percentile lead levels, and individual lead values from homes that have been sampled multiple times, can all contribute to an understanding of the quality of the water and the propensity to leach lead into the drinking water. These data will all be useful when assigning bins and taking the required actions to meet bin requirements under our suggested approach. This is one reason ASDWA is not recommending major changes in monitoring locations for the LT-LCR, so that valuable historical information remains useful.

Existing requirements for review of CCT for new sources and treatment changes should remain. Effective CCT by water systems, as well as appropriate state oversight of CCT, is critical. This includes monitoring water quality parameters and reviewing the CCT process when sources or other treatment processes change.

ASDWA recommends that regulatory requirements for water quality parameter (WQPs) monitoring be strengthened, based on the latest science on corrosion control and improved guidance for setting WQPs. ASDWA recommends increasing the number and frequency of WQP monitoring to better manage CCT. Adequate numbers of WQP samples, routinely collected at representative sites in the distribution system, provide an ongoing means of assuring that water systems maintain CCT. Sampling for WQPs at RTCR and DBP sites may be used to help manage the potential PWS burden for an increase in WQP monitoring. In addition, an expanded suite of WQPs may be monitored for a time to support the water quality assessment proposed in the "bins" approach. To support this recommendation for enhanced WQP monitoring, EPA should include adequate WQP tracking capabilities in the new SDWIS Prime data system currently under development.

In finalizing the LT-LCR, ASDWA recommends that EPA carefully consider the most appropriate method to address CCT in non-transient non-community systems (NTNCs). In NTNCs, the water is delivered through premise plumbing rather than a more traditional community water system distribution system. If a different approach to corrosion control is needed for these systems, then the rule should allow flexibility for NTNCs to take a different approach. A new rule also needs to consider the changes in water quality that can take place in consecutive systems. Long residence times can change water quality for pH, corrosion inhibitors and other parameters that can impact water corrosion. This is another area where EPA can share their corrosion control expertise and develop the appropriate guidance.

Wastewater issues resulting from phosphate addition are a serious concern that must be considered in the LT-LCR, especially if phosphate addition is proposed to be the default CCT. In any CCT approach, simultaneous compliance with all regulations must be appropriately considered. Treatment changes for one rule can easily impact compliance with other rules. As previously discussed, the Washington, DC crisis in the early 2000's is probably the most obvious example, noting that the crisis resulted from a treatment change to comply with Disinfection By-Product (DBP) regulations. It's easy to overlook the impact on the wastewater discharges when considering simultaneous compliance, but when phosphate addition is the corrosion control choice, the impact on wastewater must be examined. Increasingly restrictive wastewater effluent limits for phosphates are being put in place to control nutrients in streams and lakes. The phosphate contribution from drinking water, even if small, could cause the wastewater system to exceed its discharge limits and require installation of expensive nutrient removal treatment. The regulatory frameworks of both the Clean Water Act (CWA) and the SDWA must be integrated into the final LT-LCR. These wastewater impacts must be considered when water systems are evaluating CCT, when states are reviewing CCT proposals, and EPA needs to include those considerations in guidance for the LT-LCR. Failure to make a realistic assessment for CWA implications for mandated addition of phosphate-based corrosion inhibitors in the LT-LCR would be a mistake.

One of the opportunities and challenges EPA requested comment on is a potential default CCT. There could be some advantages with a default CCT in terms of reduced time for system planning and state review. If EPA can develop a science-based default treatment that can be easily applied to many water systems, then states could support this option. However, the preceding discussion shows how a default, at least one using phosphate addition, has challenges. Even though a default eases the process of selecting corrosion control, the treatment process must still be properly operated and maintained and WQPs set at appropriate levels. EPA should suggest, but not mandate, a default treatment and leave it to states to determine where it might be used.

Another question posed by EPA is related to plumbed-in point-of-use (POU) devices. These devices could be employed to reduce lead exposure in situations where LSLs are in place. These devices can reduce lead in the taps where they are installed. ASDWA recognizes this value and there can be situations where plumbed-in POU devices could be used, especially if that is the customer's choice. POU devices should be included in any public education material as an option for customers to reduce lead exposure. However, it should not be mandated by the LCR. It's too complicated for water systems, at least if existing POU guidance is followed, to manage POU devices. POU devices may be feasible for very small systems, but not universally. In fact, some states do not allow use of these devices for compliance. POU devices should only be considered in very limited circumstances, if at all, and should not be mandated but left to state discretion.

Corrosion control, taken in concert with other lead reduction approaches, will be a significant tool in the LT-LCR. There are opportunities to make improvements to the current rule by placing more emphasis on WQPs and using a binning process to help determine when CCT and other corrective measures are appropriate. It also offers another opportunity for EPA to provide improved guidance to assist systems and states to maximize the effectiveness of CCT. One size doesn't fit all water systems, and states will need guidance from EPA on selecting and implementing the correct approach.

Transparency and Public Education

The 1991 LCR provides a good starting point for public outreach and education. The Water Infrastructure Improvements for the Nation (WIIN) Act enhances the transparency of lead results and lead action levels. ASDWA recommends building on these existing regulatory requirements. Water systems should continue the existing consumer notifications, Consumer Confidence Report (CCR) messages, and PE distributions and continue to certify to the state what they have done. The revised rule should tighten the timelines rather than making wholesale changes in this part of the existing LCR requirements. Whenever possible, using a consistent timeframe for response would also help simplify the rule and make it easier for water systems to comply. A more uniform process will also make it easier for the states to track compliance and ease their burden as well. For the LT-LCR, EPA should develop the model language, formats, and forms that can be used nationally.

Finding customers in high-risk homes who are willing to volunteer for lead sampling is a constant challenge. Since ASDWA recommends keeping most of the existing tap sampling regime, this challenge will continue. Public information materials must inform customers about lead and encourage them to become part of the sampling pool and continue to participate, even if their own data on lead levels are fine.

The use of flushing, pitcher filters, POU devices, and other measures to reduce personal risk should be included in any informational material for the public. EPA should develop these materials based on the latest scientific studies on the effectiveness of each tool. As part of the bin approach, ASDWA is recommending more targeted outreach to those with lead service lines. This group is at a higher risk and should be taking more action to reduce that risk. This includes more specific recommendations for flushing, filters or other means to reduce short term lead exposure and proactive lead service line replacement to reduce long term risk.

Any educational materials developed for the public, and especially for homeowners, must emphasize the shared responsibility between the homeowner and the public water system, and describe what the expectations are for each party. The materials must specifically outline steps customers can take to reduce their own lead risk, especially the unique situation of customers with lead service lines – specific actions that the customers can take must be clear. In addition, because sampling high-risk sites may concentrate monitoring in certain parts of the community, any public information should explain why locations are chosen and how those in other sections of town can also determine their lead exposure.

Another important group that should be included in this outreach is the plumbing industry. Plumbers are often the first party homeowners will contact with questions about lead. Plumbers may be asked to check for lead service lines and other lead in the home. Obviously, plumbers will be involved in lead service line replacement. EPA needs to reach out to national plumbing groups and develop information and training material about lead that can be shared nationally and locally. Public education material also needs to include information to help customers talk to their plumber about managing lead in their home.

Completely resolving the problem of lead in drinking water is a long-term process that will likely take many years to complete. It is imperative that EPA develop curriculum and other educational materials for schools at all grade levels. Getting students involved at an early age will prepare them for their own response as adults but also can influence their parents to take more aggressive action now to reduce exposure to lead. Also, on the education side, schools and child care facilities need special attention. The facility or maintenance managers responsible for lead control may not be very familiar with lead issues and must be educated and re-educated on how to manage these risks. The existing 3-Ts guidance is a good start but EPA needs to examine what more may be needed to reach this audience.

Much of the information provided about lead is targeted in some way – individual home sample results; lead service line owners; schools; child care facilities; and local health agencies. However, EPA also needs to develop public service announcements and other broadly distributed material to be a constant reminder of the hazards of lead in water and what citizens can do to be better informed and reduce their risk.

The burden associated with tracking the 24-hour notice required by WIIN Act can be significant for states. This is an area where EPA needs to provide practical guidance on how to interpret the requirement. It should also allow states some flexibility in managing the process when conditions create delays that are beyond the control of the public water system.

Making tap sample results available to consumers beyond the individual homeowner is an important part of transparency. Water systems need to make good faith efforts to reach renters with individual lead results. In a broader context, the public needs to know about 90th percentile levels and the range of lead results being found in the community. Posting data on the internet is a much more available option now than it when the original rule was developed. Many more water systems have publicly accessible websites where these data could be shared. Many states also have public facing websites where sample results from public water systems are displayed. If the state choses to share lead results on their website, this state posting should be allowed to cover water systems that have a public posting requirement or option.

Tap Sampling

Tap sampling is one approach under the 1991 LCR to verify that CCT is effective in controlling lead releases in the drinking water. ASDWA supports the continuation of tap sampling for that purpose under the revised rule. ASDWA recommends that the site selection criteria remain the same for the new rule. Our bin approach is based on continued use of high-risk sites and our recommendations for an improved materials inventory support identifying the Tier 1 sites. It is important to note that evaluating lead exposure should not be confused with CCT evaluation and should have its own monitoring framework outside the LT-LCR.

ASDWA believes that every customer should know the lead levels in their own drinking water and encourages voluntary lead testing of homes by customers and water systems. However, ASDWA also believes that using only customer requested samples for compliance has the potential to dilute the sampling pool and would not provide as useful information about the performance of CCT as using the existing high-risk selection criteria. Much valuable information about the effectiveness of corrosion control can be gained by review of trends in historical sample results, especially when the same sites are sampled repeatedly. Sampling conducted outside the monitoring plan may be used effectively for other purposes, but not to determine the 90th percentile and rule compliance.

ASDWA also believes that the existing sampling protocol of first draw samples (after stagnation) is the best single approach to sampling and will provide the most consistent results for compliance purposes. Sequential sampling and other approaches may be useful to determine the location or influence of lead service lines and leaded materials, or for other special studies, but not as the compliance approach.

As noted earlier, the selection of the sample sites is critical, and states expect to closely monitor both the materials inventory and the LT-LCR monitoring plan. ASDWA recommends using sites with lead service lines first, and going to other tier 1 sites, only when no more LSL sites are available. To assure continuing sampling at high-risk sites, systems should identify additional sites above the number required for initial monitoring. This makes it easier to move to another site when a homeowner drops out of the sampling pool. Close monitoring of this process will take a significant increase in resources compared to what has been invested under the current rule. These costs are reflected in our CoSTS model.

Systems should not be able to test multiple times at a low-lead sampling location at the end of monitoring period to lower their 90th percentile. Sampling multiple times at the same location in the same compliance period goes against the goals of both the existing LCR and the LT-LCR.

ASDWA supports the NDWAC recommendation to establish a household action level. A household action level can help states, water systems, local health agencies, and individual customers determine how significant the lead risk is and how quickly they must respond. It will also help determine what follow-up action is appropriate and when that action should be taken. ASDWA recognizes that EPA is taking a deliberate approach to developing this number and using the best available science. ASDWA supports this process and encourages EPA to complete its evaluation as soon as possible so the proposed LT-LCR can request comment on a possible household action level value. If this level is exceeded, it should be the water system's responsibility to inform the local health department. Responses to the household action level should be handled at the local level as much as possible. The process will be much faster, and the action better coordinated at the local level. However, states should be informed when the level is exceeded, and advised by the water system of the follow up actions they have taken. This can be done after the fact, to avoid slowing down the response. The ultimate response to any household action level exceedance is a determination by the local health department, where they can do more specific testing and gather additional data. State drinking water programs do not need to be involved in these actions unless requested by the local agency.

The "Find and Fix" approach should be better defined. It could be used to identify issues with a sampling location or reveal CCT issues affecting a portion (or all) of the distribution system. Using the "find and fix" approach to evaluate overall CCT throughout the distribution system may be a better use of the process under the LT-LCR. A similar approach could be used for identifying specific monitoring problems or for supporting the household action level response by the local health agencies, but these would be secondary uses of the tool and may not fit as well in the LT-LCR.

The LT-LCR is not the appropriate vehicle, and public water systems are not the appropriate parties, for accomplishing school/day care center monitoring or a specific response by a school/day care center to high lead levels. This monitoring should be part of a separate program run by education and health agencies. EPA can play a significant role by bringing appropriate agencies together at the federal level and by continuing to provide educational material like the 3-Ts. EPA should also help identify funding for school testing and response. If there is not enough funding to correct problems, schools will be unable to respond to lead issues and may be reluctant to conducting testing at all.

Copper

Copper corrosion is fundamentally different than lead corrosion. Therefore, a high-risk sampling location for lead versus copper is different. Copper monitoring should be decoupled from lead. ASDWA recommends that systems that have corrosive water (as detailed below) identify separate copper compliance monitoring locations. ASDWA's CoSTS assumes that the number of copper compliance monitoring locations will be ½ of the required number of lead sampling locations. Simply doubling the number of sample sites is too great of a financial burden for both water systems and states. There is already a greater understanding of copper compared to lead. Therefore, fewer compliance sampling sites is acceptable.

The drinking water community already knows the differences between high-risk sample sites for copper versus lead. The LT-LCR should contain a waiver provision for water systems' tap sampling where sites with new copper aren't available as many small water systems don't have ongoing new construction. How would systems with no new construction comply with copper sampling requirements? The LT-LCR needs to recognize the lack of new construction, and EPA needs to provide guidance on selecting copper sampling sites.

ASDWA recommends that the LT-LCR use a binning for copper based on pH and alkalinity for aggressive water, per Figure 1 in the Roth, et al, paper (*Jour. AWWA*, 108:4:56, April 2016). ASDWA's CoSTS assumes that 50% of waters will be classified as non-corrosive using this binning approach. Water quality parameter (WQP) monitoring will be required to determine and maintain bin classifications.

Public education materials, as well as other regulatory requirements, will need to be revised in the LT-LCR to reflect the decoupling of lead and copper monitoring. This decoupling is necessary to reflect the fundamental technical differences between copper corrosion and lead corrosion.

Summary

ASDWA has provided detailed comments on the questions in the five categories presented at the January 8th Federalism Consultation Meeting, as well as providing an overall regulatory framework using "bins" that uses a progressively more stringent regulatory framework based on increasing levels of the 90th percentile of lead samples for 1-liter first draw tap samples. But much more work is needed, as there are many issues that warrant additional discussions. These comments should be the starting point for additional dialogue between ASDWA's members (as co-regulators) and EPA. ASDWA anticipates additional discussions on the LCR Long-Term Revisions between March 8th and the publication of the proposed rule on the development of guidance for the proposed water quality assessment, and for the broader outreach effort, in the "bins" regulatory framework, as well as other issues that are key to the successful development and implementation of the LCR Long-Term Revisions.

Appendix A

Costs of States' Transactions Study (CoSTS) For Potential Lead and Copper Rule (LCR) Long-Term Revisions

Costs of States' Transaction Study (CoSTS)
For Potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR)

The Environmental Protection Agency (EPA) is in the process of evaluating several options for potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR). EPA initially presented several options at a Federalism Consultation briefing on January 8, 2018 and requested comments by March 8, 2018. The Association of State Drinking Water Administrators (ASDWA) conducted this Costs of States' Transactions Study (CoSTS) as part of its comment development process for these regulatory options. The detailed spreadsheets included in this study calculate the estimated hours by the category of regulatory option presented at the January 8th meeting.

Any LT-LCR option that's selected by EPA will lead to increased workloads for the states – from tracking what is submitted to reviewing to ensure that it's correct to helping systems revise incorrect submissions to training and technical assistance to compliance and enforcement. Additionally, any new drinking water regulation has a "start-up" phase for the first few years that includes developing and adopting the state-level regulation that is at least as stringent as the federal regulation, revising the data management system and associated operating procedures, providing training and technical assistance to the water systems, and providing training to state staff on the requirements of the regulation.

The four most recent drinking water regulations have more treatment technique based regulatory frameworks than in the past. These newer regulations have been more complex for states to implement versus the traditional numerical Maximum Contaminant Levels (MCLs) in the older regulations:

- Stage 2 Disinfection By-Products Rule (DBPR) and Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)
- Groundwater Rule (GWR); and
- Revised Total Coliform Rule (RTCR).

Each of these regulations requires states to investigate and/or review an investigation or assessment by a water system or consultant. The RTCR is probably the most comparable regulation to the options being considered for the LT-LCR due to its regulatory framework that has the water system or state personnel, or qualified assessor analyze the water system to determine what created the problem. The RTCR workload for the states is significant due to the complexities of the regulation and the need to conduct/review distribution system assessments. 8,306 Level 1 and Level 2 assessments were estimated to be conducted in 2015 (the first year of these corrective actions) by EPA's contractor (Cadmus), in cooperation with state representatives, for 49 states (Wyoming doesn't have primacy). The combined national RTCR workload for 49 states was estimated by Cadmus to be 784,218 hours for 2018 – this estimate includes these assessments but also includes several other RTCR implementation activities. These RTCR hours can be used to validate our estimates for the LT-LCR.

The total estimated increased workload for the states for the LT-LCR ranges from 3.6 million hours to 4.9 million hours for the first five years of the final revised LCR, depending on the Corrosion Control Treatment (CCT) option selected as detailed in the table below (the range of

CCT options is shown as Low (L) and High (H) Hours). These estimated hours need to be converted to an annual basis to better facilitate a comparison with EPA's economic analysis, which leads to a range from 728,172 to 972,152 hours annually (note that this range brackets the RTCR hours for 2018 previously discussed). Assuming a loaded (direct and indirect costs) hourly rate of $100 per hour for a state engineer, this translates to additional burden of $73 million to $97 million annually to states for the LT-LCR. Given the states' ongoing challenges in meeting EPA's requirements for the existing drinking water regulations, this is a significant increase. This potential increase exacerbates the gradual erosion of federal funding from the Public Water System Supervision (PWSS) program from $105 million in FY 10 to $102 million annually for the past four fiscal years (FY 14 to FY 17). This flat funding also doesn't take inflation into account.

Summary of Estimated Hours for Potential Options for the LT-LCR

Category	Hours(L)	Hours(H)
Regulatory Start-Up	582,100	582,100
Lead Service Line Replacement (LSLR)	813,114	813,114
Corrosion Control Treatment (CCT)	10,430	1,230,328
Public Education & Transparency	555,102	555,102
Tap Sampling	1,479,457	1,479,457
Copper	581,487	581,487
Total from LCR Long-Term Revisions	4,021,690	5,241,588
Current LCR Hours (2018)	*380,830*	*380,830*
Increased Workload from LCR Revisions	3,640,860	4,860,758

A similar set of activities by state staff was used to develop the detailed estimate of hours for each of the above categories. The activities are:

- Tracking – any inventory or plan developed by a water system or their consultant would have to be tracked in the state's data management systems;
- Reviewing the inventories and plans;
- Following-up with those systems whose submission isn't quite correct;
- Reporting the results of each of the regulatory activities in each category to the state's data management system, and ultimately, to EPA;
- Violations for a certain percentage that either can't quite get their submissions correct or miss the submission deadlines;
    - Returning those systems to compliance through a combination of training, technical assistance, compliance and enforcement; and
- Some periodic re-evaluation of the inventories and/or plans based on changing circumstances.

The above set of activities were repeated in the spreadsheets for the five categories, plus an additional category for "Regulatory Start-Up", that were presented at EPA's January 8th Federalism Consultation Meeting. The percentages for the different water system sizes, as well as the hours for each activity, were adjusted depending on the relative complexity of the specific regulatory requirements in each category.

The percentages and the hours for each activity in each category were developed by ASDWA staff (in consultation with some state staff) and then vetted with the ASDWA Board of Directors in February 2018. For example, the estimated hours per review for tap sampling plans compare to EPA's contractor (Cadmus) estimates for reviews of RTCR sampling plans. Estimates were also compared to the model developed for ASDWA's 2013 state drinking water resource needs report.

Some of ASDWA's members have taken actions such as reviewing materials and lead service line (LSL) inventories, corrosion control treatment (CCT) and water quality parameter (WQP) monitoring that go beyond the regulatory requirements of the 1991 LCR, based on the 2016 Joel Beauvais' letters to governors and state environment and public health commissioners. However, these actions are strictly voluntary for the states that can take such actions. Many states have constitutional amendments or state-level policies such that their regulations must exactly match the federal regulations and are no more stringent than the federal regulations.

Given this restriction for many states, EPA should use the baseline hours and costs from the 1991 LCR and not consider any post-Flint actions by states. The current LCR hours in 2018, shown in italics in the above table, came from ASDWA's 2013 state drinking water resource needs report. This report estimated the hours for each regulation for 2012-2021, so this report provides us with an accurate estimate of the current LCR hours in 2018 based on the 1991 LCR. These baseline hours should be used as the starting point for the economic impact analysis for the LT-LCR.

The estimated number of hours above doesn't consider every potential regulatory component of the final LT-LCR. For example, additional hours needed by states to determine the initial "bin" placement from ASDWA's suggested "bins" regulatory option, or any progression down in "bins" based on a lower 90^{th} percentile, were not included in the above estimate. Reviewing the data from water systems for an initial "bin" assignment, and then reviewing them on an ongoing basis, could be a sizeable number of hours that would likely increase the states' costs for the LT-LCR above the Public Water System Supervision (PWSS) program funding of $102 million annually for the past four fiscal years (FY 14 to FY 17). If EPA is interested in continuing additional discussions with ASDWA on the "bin" regulatory option, then ASDWA would consider developing an estimate of those additional hours at some point in the future.

Obviously, the final estimated hours for the LT-LCR will depend on many factors, such as the regulatory option ultimately selected as well as how the compliance deadlines might be staggered during the regulatory start-up period. However, as previously discussed, any LT-LCR option that's ultimately selected by EPA will almost certainly lead to an increased workload for the states – it's just a question of how big the increase will be.

Funding options for states are limited, as funding for the states' ability to fulfill their mission of overseeing safe drinking water comes from four sources. Two primary sources are from EPA's Public Water System Supervision Program (PWSS) and the set-asides from EPA's Drinking Water State Revolving Loan Fund (DWSRF). The DWSRF funding has been essentially been flat for the past decade, so that inflation has resulted in a significant funding decline from the DWSRF set-asides over the past decade. Some states have been able to compensate by raising the dollars received from the DWSRF, but others already take the maximum percentage and must reduce expenditures. PWSS funding has gradually eroded for the past decade between inflation and a slight decline from $105 million in FY 10 to $102 million annually for the past four fiscal years (FY 14 to FY 17). The other two funding sources vary considerably from state to state and include funding from the state's general fund and fees from water systems for plan review, inspections, etc.

State drinking water programs have been chronically underfunded, on top of this gradual erosion of the DWSRF set-asides and the PWSS funding. ASDWA's 2013 state drinking water resource needs report estimated the funding gap of $240 million for a minimum base program, and $308 million for a comprehensive program that includes additional activities undertaken by states to achieve the public health protection vision and goals established by the SDWA. This report was a collaboration between EPA and ASDWA, using EPA's contractor (Cadmus) to collect the data (that was then validated by the states) and then generate the report. In an ideal world, funding for the PWSS program would be double what it is today (not including the final LT-LCR). This doubling of funding would need to be ramped up over a period of five to ten years to allow states and water systems to increase capacity for the appropriate activities that achieve the public health goals envisioned by the SDWA.

ASDWA estimates that the costs of states' staff time for the LT-LCR would be in the range of 72%-95% of the current PWSS funding. Given the uncertainties surrounding what the final LT-LCR will look like, this percentage could easily reach 100% of the current PWSS funding. Given the likely increased workload and the additional hours for state staff from the LT-LCR, states could be facing tough choices for their drinking water program – what NOT to do given these new regulatory mandates. ASDWA supports moving forward with the LT-LCR to update and modernize the 1991 LCR but additional funding should be part of the final LT-LCR. Otherwise, the final LT-LCR will be an unfunded mandate for states.

Summary of Estimated Hours for Options for Potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR)

Costs of States Transactions Survey (CoSTS)

Association of State Drinking Water Administrators (ASDWA)

3/8/18 Version

The below is based on the five categories of options from EPA's Federal Consultation brefing on 1/8/18, plus an additional category for regulatory start-up

The total hours are estimated for the first five years of the LT-LCR

Five years is assumed to be an appropriate timeframe for the first cycle of states and systems adopting and complying with the LT-LCR

The total hours don't include any estimates from the "bins" regulatory framework that are part of ASDWA's written comments

Estimated hours for Corrosion Control Treatment (CCT) are shown as a range (low-high), given the number of potential CCT options

Regulatory Start-Up	582,100	
Lead Service Line Replacment (LSLR)	813,114	
	Low	High
Corrosion Control Treatment (CCT)	10,430	1,230,328
Public Education & Transparency	555,102	
Tap Sampling	1,479,457	
Copper	581,487	
Totals	4,021,690	5,241,588
Current LCR Hours (2018)		
76,166 times 5 Years	380,830	380,830
Increased Hours from the LT-LCR (Total from first five years)	3,640,860	4,860,758
Annual Increased Hours (Each year for the first five years)	728,172	972,152

Regulatory Start-Up

	Model Inputs
	Model Outputs

Hours for each activity rounded up from Revised Total Coliform Rule (RCTR)

Adoption of Long-Term Revisions to Lead and Copper Rule (LT-LCR)

States	Hours Ea.	Total Hours
49	3,200	156,800

Modify State Data Management System

Unclear how SDWIS Prime might accommodate LT-LCR and what state changes might be needed

States	Hours Ea.	Total Hours
49	3,700	181,300

System Training and Technical Assistance

States	Hours Ea.	Total Hours
49	4,000	196,000

State Staff Training

Assume three categories for training for state staff to properly trained on all components of LT-LCR

Lead service line inventories & replacement, corrosion control treatment, public education, sampling & simultaneous compliance

			Hours Ea.	Total Hours
	Large	9	2,000	18,000
	Medium	20	1,000	20,000
	Small	20	500	10,000
Not Wyoming or DC	Total	49		48,000

This total for state staff training is in the same range as what was estimated for the Revised Total Coliform Rule (RTCR)

Total Regulatory Start-Up 582,100

Lead Service Line Replacement (LSLR)

Model Inputs
Model Outputs

	# of systems	Systems with LSLs		Systems without LSLs	
Large systems >50,000	943	700	Complex LSL Inventories & LSLR Plans	243	
Medium 3,301-50,000	8,296	5,000	Moderate LSL Inventories & LSLR Plans	3,296	
Small 25-3,300	70,657	5,500	Simpler LSL Inventories & LSLR Plans	65,157	
Total number of systems	79,896	11,200	Total number of systems with LSLs	68,696	Total no. of systems without LSLs

Initial tracking, review and follow-up for LSL inventories - complexity of inventories based on system size and whether system has LSLs or not

Assume all systems have to conduct an inventory to determine if they have LSLs or not

Assume review of systems with LSLs will take more time than systems that don't have LSLs

Assume 30% of LSLR inventories would need to be re-evaluated periodically

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Large Systems with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	700	2	1,400
Review			
	700	16	11,200
Follow-up			
15%	105	4	420
Reporting			
	700	0.5	350
Violations			
2%	14	4	56
Return to Compliance	14	4	56
Periodic LSL Inv. Re-eval.	210	8	1,680
30%		Total	15,162

Medium Sys. with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	5,000	2	10,000
Review			
	5,000	8	40,000
Follow-up			
25%	1,250	4	5,000
Reporting			
	5,000	0.5	2,500
Violations			
20%	1,000	4	4,000
Return to Compliance	1,000	4	4,000
Periodic LSLR Plan Re-eval.	1,500	6	9,000
30%		Subtotal	74,500
			15,162
		Total	89,662

Small Sys. with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	5,500	2	11,000
Review			
	5,500	4	22,000
Follow-up			
40%	2,200	4	8,800
Reporting			
	5,500	0.5	2,750
Violations			
33%	1,815	4	7,260
Return to Compliance	1,815	4	7,260
Periodic LSLR Plan Re-eval.	1,650	3	4,950
30%		Subtotal	64,020
			74,500
			15,162
		Total	153,682

Large Systems without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	243	2	486
Review			
	243	4	972
Follow-up			
10%	24	4	97
Reporting			
	243	0.5	122
Violations			
2%	5	4	19
Return to Compliance	5	4	19

Medium Sys. without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	3,296	2	6,592
Review			
	3,296	3	9,888
Follow-up			
10%	330	4	1,318
Reporting			
	3,296	0.5	1,648
Violations			
10%	330	4	1,318
Return to Compliance	330	4	1,318

Small Sys. without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	65,157	2	130,314
Review			
	65,157	2	130,314
Follow-up			
20%	13,031	4	52,126
Reporting			
	65,157	0.5	32,579
Violations			
20%	13,031	4	52,126
Return to Compliance	13,031	4	52,126

Total	1,716	30%	Subtotal	22,083	Subtotal	449,583
				1,716		22,083
			Total	23,799		1,716
					Total	473,382

Assume 30% of LSLR plans would need to be re-evaluated periodically (same as for inventories)

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Assume 5% of systems initially without LSLs find a few LSLs in the system that were unknown but found via main breaks, etc.

Additonal LSL systems (5%)	
Large	12
Medium	165
Small	3,258

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	712	2	1,424
Review			
	712	16	11,394
Follow-up			
10%	71	4	285
Reporting			
	712	0.5	356
Violations			
2%	14	4	57
Return to Compliance	14	4	57
Periodic LSLR Plan Re-eval.	214	8	1,709
30%		Total	15,283

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	5,165	2	10,330
Review			
	5,165	8	41,318
Follow-up			
10%	516	4	2,066
Reporting			
	5,165	0.5	2,582
Violations			
20%	1,033	4	4,132
Return to Compliance	1,033	4	4,132
Periodic LSLR Plan Re-eval.	1,549	6	9,297
30%		Subtotal	73,857
			15,283
		Total	89,139

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systems	8,758	2	17,516
Review			
	8,758	4	35,031
Follow-up			
25%	2,189	4	8,758
Reporting			
	8,758	0.5	4,379
Violations			
33%	2,890	4	11,560
Return to Compliance	2,890	4	11,560
Periodic LSLR Plan Re-eval.	2,627	3	7,882
30%		Subtotal	96,687
			73,857
			15,283
		Total	185,826

Initial tracking, review and folloup for pitcher filter distribution plans

Systems with LSLs		11,200	
		Hours Ea.	Total Hours
Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	2	22,400
Follow-up			
10%	1,120	1	1,120
Reporting			
	11,200	0.5	5,600
Violations			
2%	224	1	224
Return to Compliance	224	1	224
		Total	51,968

Total Lead Service Line Replacement	813,114

Corrosion Control Treatment

Model Inputs
Model Outputs

	# of systems	
Large systems >50,000	943	Complex CCT
Medium 3,301-50,000	8,296	Moderate CCT
Small 25-3,300	70,657	Simple CCT
Total number of systems	79,896	

Initial tracking, review and follow-up based on different regulatory triggers
Assume 10% of CCT plans would need to be re-evaluated periodically

		# of systems
Option 1	>50,000	943
Option 2	>10,000	8,296
Option 3	>3,300	70,657
Option 4	w LSLs	11,200

Option 1		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
	943	40	37,720
Follow-up			
25%	236	4	943
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to Compliance	19	4	75
Periodic CCT Re-eval.	94	40	3,772
10%		Total	44,943

Option 2		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
	8,296	16	132,736
Follow-up			
25%	2,074	4	8,296
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to Compliance	1,659	4	6,637
Periodic CCT Re-eval.	830	16	13,274
10%		Subtotal	188,319
			44,943
		Total	233,263

Option 3		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
	70,657	4	282,628
Follow-up			
50%	35,329	4	141,314
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to Compliance	23,317	4	93,267
Periodic CCT Re-eval.	7,066	4	28,263
10%		Subtotal	815,382
			188,319
			44,943
		Total	1,048,644

Option 4		Hours Ea.	Total Hours
Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	16	179,200
Follow-up			
25%	2,800	4	11,200
Reporting			
	11,200	0.5	5,600
Violations			
20%	2,240	4	8,960
Return to Compliance	2,240	4	8,960
Periodic CCT Re-eval.	1,120	16	17,920
10%		Total	254,240

In-line POU Option for Systems with LSLs

Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	6	67,200
Follow-up			
25%	2,800	4	11,200
Reporting			
	11,200	0.5	5,600
Violations			
20%	2,240	4	8,960
Return to Compliance	2,240	4	8,960
		Total	115,360

Default CCT Option
Assume no state review of default CCT - only review of system-demonstrated equivalence
Assume same system size triggers as above, with an assumed percentage (20%) using system-demonstrated equivalence
Assume 10% of CCT plans would need to be re-evaluated periodically

Option 1		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
20%	189	20	3,772
Follow-up			
25%	47	8	377
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Compliance	19	4	75
Periodic CCT			
Re-eval.	94	40	3,772
10%		Total	10,430

Option 2		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
20%	1,659	8	13,274
Follow-up			
25%	415	4	1,659
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to			
Compliance	1,659	4	6,637
Periodic CCT			
Re-eval.	830	16	13,274
10%		Subtotal	55,583
			10,430
		Total	66,013

Option 3		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
20%	14,131	4	56,526
Follow-up			
50%	7,066	2	14,131
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to			
Compliance	23,317	4	93,267
Periodic CCT			
Re-eval.	7,066	4	28,263
10%		Subtotal	462,097
			55,583
			10,430
		Total	528,110

Find-and-fix Option, with an assumed % of systems to find and fix exceedances of AL

	# of system:	% to fix	# of systems required for find and fix
All systems	79,896	30%	23,969

		Hours Ea.	Total Hours
Tracking			
# of systems	23,969	2	47,938
Review			
	23,969	4	95,875
Follow-up			
25%	5,992	4	23,969
Reporting			
	23,969	0.5	11,984
Violations			
2%	479	4	1,918
Return to			
Compliance	479	4	1,918
		Total	181,684

Total Corrosion Control Treatment

	Standard	Default	Find-and-Fix	Std. & FF	Default & FF
Option 1	44,943	10,430	181,684	226,627	192,113
Option 2	233,263	66,013	181,684	414,946	247,696
Option 3	1,048,644	528,110	181,684	1,230,328	709,793
Option 4	254,240		181,684	435,924	

In-Line POU	115,360

Public Education and Transparency

	# of systems
Large systems >50,000	943
Medium 3,301-50,000	8,296
Small 25-3,300	70,657
Total number of systems	79,896

Initial tracking, review and follow-up on water systems' public education and transparency plans
Assume systems with lead service lines (11,200) will have ongoing outreach with emphsis on homeowners with LSLs
Assume systems will provide notification to customers within 24 hours of exceedance of lead action level
Assume a small percentage of systems (20%) won't complete notifications and states will have to notify
Assume systems will make information accessible to customers on results of all tap samples and WQP sampling

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	943	2	1,886
Review			
	943	4	3,772
Follow-up			
10%	94	4	377
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Complianc	19	4	75
Periodic Plan			
Re-eval.	94	40	3,772
10%		Total	10,430

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systen	8,296	2	16,592
Review			
	8,296	3	24,888
Follow-up			
10%	830	2	1,659
Reporting			
	8,296	0.5	4,148
Violations			
5%	415	4	1,659
Return to			
Complianc	415	4	1,659
Periodic Plan			
Re-eval.	830	16	13,274
10%		Subtotal	63,879
			10,430
		Total	74,309

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systen	70,657	2	141,314
Review			
	70,657	2	141,314
Follow-up			
10%	7,066	2	14,131
Reporting			
	70,657	0.5	35,329
Violations			
10%	7,066	4	28,263
Return to			
Complianc	7,066	4	28,263
Periodic CCT			
Re-eval.	7,066	4	28,263
10%		Subtotal	416,876
			63,879
			10,430
		Total	491,185

WIIN Notifications

Assume states will make 20% of WIIN Notifications					20%								
Large Systems		Hours Ea.	Total Hours		Medium Systems		Hours Ea.	Total Hours		Small Systems		Hours Ea.	Total Hours
Notifications					Notifications					Notifications			
# of systen	189	4	754		# of systen	1,659	4	6,637		# of systen	14,131	4	56,526
												Total	63,917

Total for Public Eduction & Transparency	555,102

Tap Sampling

	Model Inputs
	Model Outputs

	# of systems	
Large systems >50,000	943	Complex Sampling Plans
Medium 3,301-50,000	8,296	Moderate Sampling Plans
Small 25-3,300	70,657	Simple Sampling Plans
Total number of systems	79,896	

Initial tracking, review and follow-up on sampling plans
Assume 10% of sampling plans would need to be re-evaluated periodically

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
	943	16	15,088
Follow-up			
15%	141	4	566
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Compliance	19	4	75
Periodic Plan			
Re-eval.	830	8	6,637
10%		Total	24,799

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
	8,296	8	66,368
Follow-up			
25%	2,074	4	8,296
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to			
Compliance	1,659	4	6,637
Periodic Plan			
Re-eval.	830	6	4,978
10%		Subtotal	113,655
			24,799
		Total	138,454

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
	70,657	4	282,628
Follow-up			
40%	28,263	4	113,051
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to			
Compliance	23,317	4	93,267
Periodic Plan			
Re-eval.	7,066	3	21,197
10%		Subtotal	780,053
			113,655
			24,799
		Total	918,507

Notification(s) of household action level exceedance

Initial tracking, review and follow-up on notification plans
Assume 10% of notification plans would need to be re-evaluated periodically

Large Systems		Hours Ea.	Total Hours
Tracking			

Medium Systems		Hours Ea.	Total Hours
Tracking			

Small Systems		Hours Ea.	Total Hours
Tracking			

# of systems	943	2	1,886
Review			
	943	4	3,772
Follow-up			
25%	236	2	472
Reporting			
	943	0.5	472
Violations			
2%	19	2	38
Return to			
Compliance	19	2	38
Periodic Plan			
Re-eval.	94	2	189
10%		Total	6,865

# of systems	8,296	2	16,592
Review			
	8,296	3	24,888
Follow-up			
25%	2,074	2	4,148
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	2	3,318
Return to			
Compliance	1,659	2	3,318
Periodic Plan			
Re-eval.	830	2	1,659
10%		Subtotal	58,072
			6,865
		Total	64,937

# of systems	70,657	2	141,314
Review			
	70,657	2	141,314
Follow-up			
50%	35,329	2	70,657
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	2	46,634
Return to			
Compliance	23,317	2	46,634
Periodic CCT			
Re-eval.	7,066	2	14,131
10%		Subtotal	496,012
			58,072
			6,865
		Total	560,949

Total Tap Sampling	1,479,457

Copper

(shaded)	**Model Inputs**
(shaded)	**Model Outputs**

	# of systems	Non-Corrosive	# of systems to sample for copper
Large systems >50,000	943	50%	472
Medium 3,301-50,000	8,296	50%	4,148
Small 25-3,300	70,657	50%	35,329
Total number of systems	79,896		

Initial tracking, review and follow-up on copper sampling plans
Assume the number of copper sampling sites would be half of lead sampling sites - state review time half of lead review
Assume 10% of sampling plans would need to be re-evaluated periodically

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	472	2	943
Review			
	472	12	5,658
Follow-up			
15%	71	4	283
Reporting			
	472	0.5	236
Violations			
2%	9	4	38
Return to			
Complianc	9	4	38
Periodic Plan			
Re-eval.	47	8	377
10%		Total	7,572

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	4,148	2	8,296
Review			
	4,148	6	24,888
Follow-up			
15%	622	4	2,489
Reporting			
	4,148	0.5	2,074
Violations			
20%	830	4	3,318
Return to			
Compliance	830	4	3,318
Periodic Plan			
Re-eval.	415	6	2,489
10%		Subtotal	46,872
			7,572
		Total	54,445

Small Systems		Hours Ea.	Total Hours
Tracking			
# of syster	35,329	2	70,657
Review			
	35,329	2	70,657
Follow-up			
25%	8,832	4	35,329
Reporting			
	35,329	0.5	17,664
Violations			
33%	11,658	4	46,634
Return to			
Complianc	11,658	4	46,634
Periodic Plan			
Re-eval.	3,533	3	10,599
10%		Subtotal	298,173
			46,872
			7,572
		Total	352,617

Initial tracking, review (simple), and follow-up for the other half of systems with non-corrosive water

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	472	2	943
Review			
	472	2	943

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	4,148	2	8,296
Review			
	4,148	2	8,296

Small Systems		Hours Ea.	Total Hours
Tracking			
# of syster	35,329	2	70,657
Review			
	35,329	2	70,657

Follow-up			
15%	71	2	141
Reporting			
	472	0.5	236
Violations			
2%	9	2	19
Return to			
Complianc	9	2	19
Periodic Plan			
Re-eval.	47	2	94
10%		Total	2,395

Follow-up			
15%	622	2	1,244
Reporting			
	4,148	0.5	2,074
Violations			
5%	207	2	415
Return to			
Compliance	207	2	415
Periodic Plan			
Re-eval.	415	2	830
10%		Subtotal	21,570
			2,395
		Total	23,965

Follow-up			
25%	8,832	2	17,664
Reporting			
	35,329	0.5	17,664
Violations			
15%	5,299	2	10,599
Return to			
Complianc	5,299	2	10,599
Periodic CCT			
Re-eval.	3,533	2	7,066
10%		Subtotal	204,905
			21,570
			2,395
		Total	228,870

Total for copper 581,487

Appendix B

Summary Recommendations from ASDWA Report On Insufficient Resources to Drinking Water Programs Threaten Public Health

Insufficient Resources
for State Drinking Water Programs
Threaten Public Health

Recommendations from the Association of State Drinking Water Administrators

December 2013

Association of State Drinking Water Administrators
December 2013

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ACRONYMS

ASDWA	Association of State Drinking Water Administrators
CWA	Clean Water Act
DWSRF	Drinking Water State Revolving Fund
EPA	U.S. Environmental Protection Agency
FY	Fiscal Year
PWSS	Public Water System Supervision
SDWA	Safe Drinking Water Act

These recommendations were developed by the Association of State Drinking Water Administrators (ASDWA) and the directors of state drinking water programs, as a companion document to the report entitled *Insufficient Resources for State Drinking Water Programs Threaten Public Health – An Analysis of State Drinking Water Programs' Resources and Needs.* These recommendations address the issues and concerns noted in the analysis report, especially the current and widening funding gap faced by state drinking water programs.

The authors have recognized for many years a widening gap between available resources and the resources needed to implement even a minimum base program. The analysis report describes the expanding role that state drinking water programs play in supporting water systems and ensuring safe drinking water. It points out that even as resource needs are increasing, the funding available to support the state drinking water programs in their mission has stagnated. The analysis report shows that if funding continues at current levels, states will not have adequate funding to support their minimum base programs over the next ten years.

The following are ASDWA's recommendations to Congress, the United States Environmental Protection Agency (EPA) and states for helping to address the current and projected shortfalls in federal and state resources needed to support state drinking water programs. These recommendations include ideas for providing additional funding to state drinking water programs as well as policy and programmatic approaches for making the best use of available funds. They are consistent with recommendations ASDWA has made over the past several years in various forums and to various audiences. The recommendations in each subsection are in priority order.

Recommendations to Congress: Appropriations-Related

Increase funding for the Public Water System Supervision (PWSS) Grant Program. ASDWA recommends that the size of this grant program should be increased from the current $100.05 million (in fiscal year [FY] 2013) to at least $200 million. Although the PWSS appropriation increased following the 1996 Safe Drinking Water Act (SDWA) Amendments, it has not grown appreciably since then to keep pace with increasing state workloads, with the expanding suite of established drinking water standards or with inflation. The increases of a few million dollars in the past few years, though welcome, have been counterbalanced by the elimination of the state security grant (as described below). The PWSS Grant Program is the principal and most important source of funding for states because of its flexibility in supporting state programs, and because it is a dedicated source of funding for drinking water program implementation—unlike the set-asides that are derived from the Drinking Water State Revolving Fund (DWSRF), for example, which are in competition to a certain extent with infrastructure funds. ASDWA further recommends that the formula for PWSS Grant allocations be reconsidered and revised, as appropriate, so as not to punish states whose inventory has nominally decreased (but whose workload has not decreased proportionately) as a result of system consolidation. And—as noted below—when DWSRF funding for state programs via set-asides decreases, an increase in PWSS Grant funding will be required to ensure the continuity of state programs.

Increase funding for the DWSRF. Current funding for the DWSRF stands at $853.8 million (in FY 2013). ASDWA believes that $1.3 billion—which is approximately the level appropriated in FY 2010 and the amount requested by the President in FY 2011—is an appropriate funding level. Compelling arguments have been made—by EPA, the American Water Works Association, the American Society of Civil Engineers and others—about the need for greater federal support for infrastructure funding, given the extent of infrastructure needs for decades to come. Apart from those cogent arguments for increased DWSRF funding, ASDWA would like to emphasize that states urgently need greater funding levels for the DWSRF so that more funding for state programs can be made available through the set-asides. Increased funding for the DWSRF would make more funding available for both infrastructure and state programs, thereby lessening the pressure for tradeoffs between those uses. ASDWA also believes that it is important to plan for a time when the annual DWSRF appropriation declines significantly and the fund principally "revolves" without infusion of substantial new appropriations. At such time, the annual appropriation for the PWSS Grant Program (discussed above) should be further augmented to offset reductions in funding for state programs from DWRSF set-asides.

Restore the Drinking Water Security Grant Program. ASDWA recommends restoring the Security Grant Program and increasing its funding to at least $10 million. The original Drinking Water Security Grant Program, while rather modest (approximately $5 million per year in FY 2002-2010), was nonetheless instrumental in helping states establish and implement state drinking water security programs to deal comprehensively with hazards and security threats, including those posed by both manmade and natural disasters. When the grant was discontinued, many states resorted to using PWSS Grants or DWSRF set-asides to continue to fund state drinking water security programs. Several states, due to the cut in federal funding, have effectively shut down (at least for the present) their drinking water security programs, and must take a reactive rather than proactive stance to security concerns. Restoration of this grant would be an important step in helping support the critical state role in ensuring drinking water sector security.

Recommendations to Congress: Legislation-Related

Adjust the Matching Requirements for the 10 Percent Set-Aside. ASDWA recommends that Congress remove the extra 100 percent matching requirement (which is on top of the 20 percent overall DWSRF matching requirement) for the state program set-aside. Section 1452(g)(2)(D) of the SDWA specifies that in order to receive the 10 percent set-aside for a variety of state program activities, a state must match the federal funds dollar-for-dollar. This 100 percent match requirement for the set-aside is in addition to the overall 20 percent match required for the DWSRF as a whole under section 1452(e). For states that cannot meet this 100 percent matching requirement, the set-aside is effectively unavailable. Furthermore, the cumulative 120 percent matching requirement for the state program set-aside is inconsistent with other program requirements under the SDWA and the Clean Water Act (CWA). For example, section 1443(a) of the SDWA for the PWSS Grant requires a 25 percent state match. Section 106 of the CWA does not require any monetary match in order to receive state grant funds, and the CWA only requires a 20 percent state match for the capitalization grant provided for the Clean Water SRF. Removal of the additional 100 percent matching requirement from section 1452(g)(2)(D) of the SDWA would make the requirement consistent with similar obligations elsewhere in the statute and make these funds more accessible to states for critical state drinking water program activities.

Increase the 4 Percent Set-Aside. ASDWA recommends that Congress increase the administrative set-aside from 4 percent to 6 percent by amending section 1452(g)(2). Over the course of more than 15 years of state experience in administering the DWSRF, it has become evident that for many states and for certain kinds of projects, the 4 percent set-aside provided for administrative purposes is simply inadequate. The current requirements for engineering, loan officer activities, accounting and other administrative tasks exceed the value of the 4 percent set-aside for complex projects in many states. Administration of the fund has become increasingly challenging over recent years as the number of applicable executive orders, federal regulations and policies associated with the fund have grown. At the same time, as new drinking water standards are established, state loan officers must consider a wider range of infrastructure projects in need of funding to meet those standards. ASDWA does not expect that all states would claim additional needs under the administrative set-aside if the allowable percentage was increased. Some states find the currently allowable amount fully sufficient for their needs. Others, however, do have administrative needs that exceed the current 4 percent set-aside. In making this recommendation, ASDWA wishes to emphasize that any increases in this set-aside should not come at the expense of the other available set-asides. In other words, the total available from all set-asides would increase from 31 percent to 33 percent under this recommendation. Indeed, states find the 2 percent (capacity development) and 10 percent (state programs) set-aside categories to be particularly vital to administering their programs.

Recommendations to State Legislatures and State Drinking Water Programs

State drinking water programs are inherently preventative and proactive in nature. When they do their job well, they do not make headlines. They thus tend to become "victims of their own success," typically having a low profile among state-level decision-makers' many competing priorities. As a foundation for all of the following recommendations, state drinking water programs should actively inform and educate state legislatures and state agency decision-makers about the criticality and value of the work they do for the welfare of the citizens of their state.

Employ Efficiencies. ASDWA recommends that state drinking water programs use all appropriate efficiency, streamlining and collaboration measures to make optimum use of existing resources and leverage resources of other programs. States have explored and adopted an array of innovative practices in recent years designed to make their programs more efficient and streamlined. Much has been accomplished in this regard, and there are numerous state best practices that have been shared among states through conferences, ASDWA and EPA workgroups, and informal networking. ASDWA recommends that states continue to explore and consider such approaches—and continue to share best practices with one another.

Increase State Fees or Put New Fee Systems in Place. Wherever feasible and appropriate, ASDWA recommends that state drinking water programs put in place fee systems (where they do not currently exist), or raise existing fees, to increase funding. In most cases, state drinking water programs need state legislative approval for establishing or expanding fee systems. Such approval is especially difficult in these resource-constrained times. States that have been effective in this regard have tended to use a strategy of gaining widespread stakeholder support by transparently describing the nature of their resource challenges and explaining what state services are not (or will no longer be) provided without the increase in fees.

Increase State General Funds. ASDWA recommends that, wherever feasible, state legislatures appropriate, and state agencies direct, more state general funds for use by state drinking water programs. This recommendation, like that for fee systems, represents a particular challenge for states during these resource-constrained times and requires the support of both state legislatures and executive branches. To make the argument for urgently needed funds to state legislatures, advocates should articulate the critical public health protection mission of state drinking water programs.

Remove Hiring Caps and Freezes. ASDWA recommends that state decision-makers should, wherever conditions allow, support hiring additional staff for the drinking water program by eliminating hiring freezes and removing staffing caps. In many states, rather strict staffing limits—including hiring freezes and caps—have been imposed at the state executive, legislative and agency levels. These steps have been taken in response to downturns in both the national and state economies and diminished or flat federal and state appropriations. As a result, state drinking water programs often cannot hire staff to fill vacancies or respond to increased workloads. As a consequence of these policies, state staff who leave or retire (many of whom are quite senior and experienced) often cannot be replaced. These restrictions can diminish morale, as state employees grow more overworked and feel the losses of this expertise.

Recommendations to States and EPA

Priority-Setting. ASDWA recommends that states engage their EPA regional office counterparts on setting priorities for achieving their public health protection mission within resource constraints. Increasingly, states have needed to set priorities carefully to favor those activities most likely to protect public health and to suspend or delay those activities that do not substantially contribute to that goal. States should continue to engage in these discussions and examinations, in partnership with the EPA regional offices, on a regular basis.

DWSRF Set-Asides Usage. ASDWA recommends that EPA exercise flexibility in its review of state workplans for set-aside usage, and develop clarifying guidance and policy as needed in this regard. Based on state experiences since the inception of the DWSRF, ASDWA believes that there is an array of eligible and worthwhile uses of the set-asides (e.g., use of the 15 percent set-aside for state source water protection activities). ASDWA wishes to ensure that these various uses are routinely considered and made available to states by all EPA regions, in consultation with EPA's Office of Ground Water and Drinking Water.


ATTENTION
GROUND WATER
PROTECTION
AREA

Costs of States' Transaction Study (CoSTS)
For Potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR)

The Environmental Protection Agency (EPA) is in the process of evaluating several options for potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR). EPA initially presented several options at a Federalism Consultation briefing on January 8, 2018 and requested comments by March 8, 2018. The Association of State Drinking Water Administrators (ASDWA) conducted this Costs of States' Transactions Study (CoSTS) as part of its comment development process for these regulatory options. The detailed spreadsheets included in this study calculate the estimated hours by the category of regulatory option presented at the January 8th meeting.

Any LT-LCR option that is ultimately selected by EPA will lead to increased workloads for the states. The final regulatory option doesn't matter as any regulatory change to the current Lead and Copper Rule (LCR) will lead to additional actions by the states – from tracking what is submitted to reviewing to ensure that it's correct to helping systems revise incorrect submissions to training and technical assistance to compliance and enforcement. Additionally, any new drinking water regulation has a "start-up" phase for the first few years that includes developing and adopting the state-level regulation that is at least as stringent as the federal regulation, revising the data management system and associated operating procedures, providing training and technical assistance to the water systems, and providing training to state staff on the requirements of the regulation.

The four most recent drinking water regulations have more treatment technique based regulatory frameworks than in the past. These newer regulations have been more complex for states to implement versus the traditional numerical Maximum Contaminant Levels (MCLs) in the older regulations:

- Stage 2 Disinfection By-Products Rule (DBPR) and Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)
- Groundwater Rule (GWR); and
- Revised Total Coliform Rule (RTCR).

Each of these regulations requires states to investigate and/or review an investigation or assessment by a water system or consultant. The RTCR is probably the most comparable regulation to the options being considered for the LT-LCR due to its regulatory framework that has the water system or state personnel, or qualified assessor analyze the water system to determine what created the problem. The RTCR workload for the states is significant due to the complexities of the regulation and the need to conduct/review distribution system assessments. 8,306 Level 1 and Level 2 assessments were estimated to be conducted in 2015 (the first year of these corrective actions) by EPA's contractor (Cadmus), in cooperation with state representatives, for 49 states (Wyoming doesn't have primacy). The combined national RTCR workload for 49 states was estimated by Cadmus to be 784,218 hours for 2018 – this estimate includes these assessments but also includes several other RTCR implementation activities. These RTCR hours can be used to validate our estimates for the LT-LCR.

The initial estimate submitted to EPA by the Agency's deadline of March 8th (60 days from the initial January 8th meeting) estimated the total increased workload for the states for the LT-LCR to range from 3.6 million hours to 4.9 million hours for the first five years of the final revised LCR, depending on the Corrosion Control Treatment (CCT) option selected. Additional estimates were developed for the determination of "bins" added 215,719 hours to this initial estimated, increasing the total to 3.9 million hours to 5.1 million hours as detailed in the table below (the range of CCT options is shown as Low (L) and High (H) Hours).

These estimated hours need to be converted to an annual basis to better facilitate a comparison with EPA's economic analysis, which leads to a range from 771,316 to 1,015,295 hours annually (note that this range brackets the RTCR hours for 2018 previously discussed). Assuming a loaded (direct and indirect costs) hourly rate of $100 per hour for a state engineer, this translates to additional burden of $77 million to $101 million annually to states for the LT-LCR. Given the states' ongoing challenges in meeting EPA's requirements for the existing drinking water regulations, this is a significant increase. This potential increase exacerbates the gradual erosion of federal funding from the Public Water System Supervision (PWSS) program from $105 million in FY 10 to $102 million annually for the past four fiscal years (FY 14 to FY 17). This flat funding also doesn't take inflation into account.

Summary of Estimated Hours for Potential Options for the LT-LCR

Category	Hours(L)	Hours(H)
Regulatory Start-Up	582,100	582,100
Bin Determinations	215,719	215,719
Lead Service Line Replacement (LSLR)	813,114	813,114
Corrosion Control Treatment (CCT)	10,430	1,230,328
Public Education & Transparency	555,102	555,102
Tap Sampling	1,479,457	1,479,457
Copper	581,487	581,487
Total from LCR Long-Term Revisions	4,237,4090	5,457,307
Current LCR Hours (2018)	*380,830*	*380,830*
Increased Workload from LCR Revisions	3,856,579	5,076,477

A similar set of activities by state staff was used to develop the detailed estimate of hours for each of the above categories. The activities are:

- Tracking – any inventory or plan developed by a water system or their consultant would have to be tracked in the state's data management systems;
- Reviewing the inventories and plans;
- Following-up with those systems whose submission isn't quite correct;
- Reporting the results of each of the regulatory activities in each category to the state's data management system, and ultimately, to EPA;
- Violations for a certain percentage that either can't quite get their submissions correct or miss the submission deadlines;
    - Returning those systems to compliance through a combination of training, technical assistance, compliance and enforcement; and

- Some periodic re-evaluation of the inventories and/or plans based on changing circumstances.

The above set of activities were repeated in the spreadsheets for the five categories, plus two additional categories (one for "Regulatory Start-Up" and the second for determination of "bins"), that were presented at EPA's January 8th Federalism Consultation Meeting. The percentages for the different water system sizes, as well as the hours for each activity, were adjusted depending on the relative complexity of the specific regulatory requirements in each category.

The percentages and the hours for each activity in each category were developed by ASDWA staff (in consultation with some state staff) and then vetted with the ASDWA Board of Directors in February 2018. For example, the estimated hours per review for tap sampling plans compare to EPA's contractor (Cadmus) estimates for reviews of RTCR sampling plans. Estimates were also compared to the model developed for ASDWA's 2013 state drinking water resource needs report.

Some of ASDWA's members have taken actions such as reviewing materials and lead service line (LSL) inventories, corrosion control treatment (CCT) and water quality parameter (WQP) monitoring that go beyond the regulatory requirements of the 1991 LCR, based on the 2016 Joel Beauvais' letters to governors and state environment and public health commissioners. However, these actions are strictly voluntary for the states that can take such actions. Many states have constitutional amendments or state-level policies such that their regulations must exactly match the federal regulations and are no more stringent than the federal regulations.

Given this restriction for many states, EPA should use the baseline hours and costs from the 1991 LCR and not consider any post-Flint actions by states. The current LCR hours in 2018, shown in italics in the above table, came from ASDWA's 2013 state drinking water resource needs report. This report estimated the hours for each regulation for 2012-2021, so this report provides us with an accurate estimate of the current LCR hours in 2018 based on the 1991 LCR. These baseline hours should be used as the starting point for the economic impact analysis for the LT-LCR.

The estimated number of hours above doesn't consider every potential regulatory component of the final LT-LCR. For example, additional hours needed by states to determine the initial "bin" placement from ASDWA's suggested "bins" regulatory option, or any progression down in "bins" based on a lower 90th percentile, were not included in the above estimate. Reviewing the data from water systems for an initial "bin" assignment, and then reviewing them on an ongoing basis, could be a sizeable number of hours that would likely increase the states' costs for the LT-LCR above the Public Water System Supervision (PWSS) program funding of $102 million annually for the past four fiscal years (FY 14 to FY 17). If EPA is interested in continuing additional discussions with ASDWA on the "bin" regulatory option, then ASDWA would consider developing an estimate of those additional hours at some point in the future.

Obviously, the final estimated hours for the LT-LCR will depend on many factors, such as the regulatory option ultimately selected as well as how the compliance deadlines might be staggered during the regulatory start-up period. However, as previously discussed, any LT-LCR option that's ultimately selected by EPA will almost certainly lead to an increased workload for the states – it's just a question of how big the increase will be.

Funding options for states are limited, as funding for the states' ability to fulfill their mission of overseeing safe drinking water comes from four sources. Two primary sources are from EPA's Public Water System Supervision Program (PWSS) and the set-asides from EPA's Drinking Water State Revolving Loan Fund (DWSRF). The DWSRF funding has been essentially been flat for the past decade, so that inflation has resulted in a significant funding decline from the DWSRF set-asides over the past decade. Some states have been able to compensate by raising the dollars received from the DWSRF, but others already take the maximum percentage and must reduce expenditures. PWSS funding has gradually eroded for the past decade between inflation and a slight decline from $105 million in FY 10 to $102 million annually for the past four fiscal years (FY 14 to FY 17). The other two funding sources vary considerably from state to state and include funding from the state's general fund and fees from water systems for plan review, inspections, etc.

State drinking water programs have been chronically underfunded, on top of this gradual erosion of the DWSRF set-asides and the PWSS funding. ASDWA's 2013 state drinking water resource needs report estimated the funding gap of $240 million for a minimum base program, and $308 million for a comprehensive program that includes additional activities undertaken by states to achieve the public health protection vision and goals established by the SDWA. This report was a collaboration between EPA and ASDWA, using EPA's contractor (Cadmus) to collect the data (that was then validated by the states) and then generate the report. In an ideal world, funding for the PWSS program would be double what it is today (not including the final LT-LCR). This doubling of funding would need to be ramped up over a period of five to ten years to allow states and water systems to increase capacity for the appropriate activities that achieve the public health goals envisioned by the SDWA.

ASDWA estimates that the costs of states' staff time for the LT-LCR would be in the range of 76%-99% of the current PWSS funding. Given the uncertainties surrounding what regulatory components might (or might not be) included in the final LT-LCR, this percentage could easily increase to over 100% of the current PWSS funding. Changes to one regulation, admittedly the most complex drinking water regulation, could potentially double states' workload. Given the likely increased workload and the additional hours for state staff from the LT-LCR, states could be facing tough choices for their drinking water program – what NOT to do given these new regulatory mandates. ASDWA supports moving forward with the LT-LCR to update and modernize the 1991 LCR but additional funding should be part of the final LT-LCR. Otherwise, the final LT-LCR will be an unfunded mandate for states.

Summary of Estimated Hours for Options for Potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR)

Costs of States Transactions Survey (CoSTS)

Association of State Drinking Water Administrators (ASDWA)

4/3/18 Version

The summary below is based on the five categories of options from EPA's Federal Consultation brefing on 1/8/18,
plus two additional categories for regulatory start-up and bin determination
The total hours are estimated for the first five years of the LT-LCR
Five years is assumed to be an appropriate timeframe for the first cycle of states and systems adopting and complying with the LT-LCR
Estimated hours for Corrosion Control Treatment (CCT) are shown as a range (low-high), given the number of potential CCT options

Regulatory Start-Up			582,100	
Bin Determination			215,719	
Lead Service Line Replacment (LSLR)			813,114	
			Low	High
Corrosion Control Treatment (CCT)			10,430	1,230,328
Public Education & Transparency			555,102	
Tap Sampling			1,479,457	
Copper			581,487	
Totals			4,237,409	5,457,307
Current LCR Hours (2018)				
76,166	times	5 Years	380,830	380,830
Increased Hours from the LT-LCR (Total from first five years)			3,856,579	5,076,477
Annual Increased Hours (Each year for the first five years)			771,316	1,015,295

Regulatory Start-Up

	Model Inputs
	Model Outputs

Hours for each activity rounded up from Revised Total Coliform Rule (RCTR)

Adoption of Long-Term Revisions to Lead and Copper Rule (LT-LCR)

States	Hours Ea.	Total Hours
49	3,200	156,800

Modify State Data Management System

Unclear how SDWIS Prime might accommodate LT-LCR and what state changes might be needed

States	Hours Ea.	Total Hours
49	3,700	181,300

System Training and Technical Assistance

States	Hours Ea.	Total Hours
49	4,000	196,000

State Staff Training

Assume three categories for training for state staff to properly trained on all components of LT-LCR

Lead service line inventories & replacement, corrosion control treatment, public education, sampling & simultaneous compliance

			Hours Ea.	Total Hours
	Large	9	2,000	18,000
	Medium	20	1,000	20,000
	Small	20	500	10,000
Not Wyoming or DC	Total	49		48,000

This total for state staff training is in the same range as what was estimated for the Revised Total Coliform Rule (RTCR)

Total Regulatory Start-Up 582,100

Bin Determination

	# of systems
Large systems >50,000	943
Medium 3,301-50,000	8,296
Small 25-3,300	70,657
Total number of systems	79,896

	Model Inputs
	Model Outputs

Assume states will use the latest two rounds of LCR Compliance Monitoring for initial bin determination, using the higher 90th percentile

Assume states's review of initial bin placement will be relatively short since it's a 90th percentile but some data review will be needed

Assumes a small percentage (10%) of systems will want to move to a lower bin whenver possible during the first five years

Assumes 2 hours would be needed for bin re-evaluation (versus 1 hour for initial) due to more back-and-forth between systems and states

All systems		Hours Ea.	Total Hours
Tracking			
# of systen	79,896	1	79,896
Review			
	79,896	1	79,896
Reporting			
	79,896	0.5	39,948
Periodic			
Bin Re-Eva	7,990	2	15,979
10%		Total	215,719

Lead Service Line Replacement (LSLR)

Model Inputs
Model Outputs

	# of systems	Systems with LSLs		Systems without LSLs	
Large systems >50,000	943	700	Complex LSL Inventories & LSLR Plans	243	
Medium 3,301-50,000	8,296	5,000	Moderate LSL Inventories & LSLR Plans	3,296	
Small 25-3,300	70,657	5,500	Simpler LSL Inventories & LSLR Plans	65,157	
Total number of systems	79,896	11,200	Total number of systems with LSLs	68,696	Total no. of systems without LSLs

Initial tracking, review and follow-up for LSL inventories - complexity of inventories based on system size and whether system has LSLs or not

Assume all systems have to conduct an inventory to determine if they have LSLs or not

Assume review of systems with LSLs will take more time than systems that don't have LSLs

Assume 30% of LSLR inventories would need to be re-evaluated periodically

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Large Systems with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	700	2	1,400
Review			
	700	16	11,200
Follow-up			
15%	105	4	420
Reporting			
	700	0.5	350
Violations			
2%	14	4	56
Return to			
Compliance	14	4	56
Periodic LSL			
Inv. Re-eval.	210	8	1,680
30%		Total	15,162

Medium Sys. with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	5,000	2	10,000
Review			
	5,000	8	40,000
Follow-up			
25%	1,250	4	5,000
Reporting			
	5,000	0.5	2,500
Violations			
20%	1,000	4	4,000
Return to			
Compliance	1,000	4	4,000
Periodic LSLR			
Plan Re-eval.	1,500	6	9,000
30%		Subtotal	74,500
			15,162
		Total	89,662

Small Sys. with LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	5,500	2	11,000
Review			
	5,500	4	22,000
Follow-up			
40%	2,200	4	8,800
Reporting			
	5,500	0.5	2,750
Violations			
33%	1,815	4	7,260
Return to			
Compliance	1,815	4	7,260
Periodic LSLR			
Plan Re-eval.	1,650	3	4,950
30%		Subtotal	64,020
			74,500
			15,162
		Total	153,682

Large Systems without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	243	2	486
Review			
	243	4	972
Follow-up			
10%	24	4	97
Reporting			
	243	0.5	122
Violations			
2%	5	4	19
Return to			
Compliance	5	4	19

Medium Sys. without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	3,296	2	6,592
Review			
	3,296	3	9,888
Follow-up			
10%	330	4	1,318
Reporting			
	3,296	0.5	1,648
Violations			
10%	330	4	1,318
Return to			
Compliance	330	4	1,318

Small Sys. without LSLs		Hours Ea.	Total Hours
Tracking			
# of systems	65,157	2	130,314
Review			
	65,157	2	130,314
Follow-up			
20%	13,031	4	52,126
Reporting			
	65,157	0.5	32,579
Violations			
20%	13,031	4	52,126
Return to			
Compliance	13,031	4	52,126

Total	1,716	30%	Subtotal	22,083	Subtotal	449,583
				1,716		22,083
			Total	23,799		1,716
					Total	473,382

Assume 30% of LSLR plans would need to be re-evaluated periodically (same as for inventories)

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Assume 5% of systems initially without LSLs find a few LSLs in the system that were unknown but found via main breaks, etc.

Additonal LSL systems (5%)	
Large	12
Medium	165
Small	3,258

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	712	2	1,424
Review			
	712	16	11,394
Follow-up			
10%	71	4	285
Reporting			
	712	0.5	356
Violations			
2%	14	4	57
Return to			
Compliance	14	4	57
Periodic LSLR			
Plan Re-eval.	214	8	1,709
30%		Total	15,283

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	5,165	2	10,330
Review			
	5,165	8	41,318
Follow-up			
10%	516	4	2,066
Reporting			
	5,165	0.5	2,582
Violations			
20%	1,033	4	4,132
Return to			
Compliance	1,033	4	4,132
Periodic LSLR			
Plan Re-eval.	1,549	6	9,297
30%		Subtotal	73,857
			15,283
		Total	89,139

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systems	8,758	2	17,516
Review			
	8,758	4	35,031
Follow-up			
25%	2,189	4	8,758
Reporting			
	8,758	0.5	4,379
Violations			
33%	2,890	4	11,560
Return to			
Compliance	2,890	4	11,560
Periodic LSLR			
Plan Re-eval.	2,627	3	7,882
30%		Subtotal	96,687
			73,857
			15,283
		Total	185,826

Initial tracking, review and folloup for pitcher filter distribution plans

Systems with LSLs		11,200	
		Hours Ea.	Total Hours
Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	2	22,400
Follow-up			
10%	1,120	1	1,120
Reporting			
	11,200	0.5	5,600
Violations			
2%	224	1	224
Return to			
Compliance	224	1	224
		Total	51,968

Total Lead Service Line Replacement 813,114

Corrosion Control Treatment

	Model Inputs
	Model Outputs

	# of systems	
Large systems >50,000	943	Complex CCT
Medium 3,301-50,000	8,296	Moderate CCT
Small 25-3,300	70,657	Simple CCT
Total number of systems	79,896	

Initial tracking, review and follow-up based on different regulatory triggers
Assume 10% of CCT plans would need to be re-evaluated periodically

		# of systems
Option 1	>50,000	943
Option 2	>10,000	8,296
Option 3	>3,300	70,657
Option 4	w LSLs	11,200

Option 1		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
	943	40	37,720
Follow-up			
25%	236	4	943
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to Compliance	19	4	75
Periodic CCT Re-eval.	94	40	3,772
10%		Total	44,943

Option 2		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
	8,296	16	132,736
Follow-up			
25%	2,074	4	8,296
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to Compliance	1,659	4	6,637
Periodic CCT Re-eval.	830	16	13,274
10%		Subtotal	188,319
			44,943
		Total	233,263

Option 3		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
	70,657	4	282,628
Follow-up			
50%	35,329	4	141,314
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to Compliance	23,317	4	93,267
Periodic CCT Re-eval.	7,066	4	28,263
10%		Subtotal	815,382
			188,319
			44,943
		Total	1,048,644

Option 4		Hours Ea.	Total Hours
Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	16	179,200
Follow-up			
25%	2,800	4	11,200
Reporting			
	11,200	0.5	5,600
Violations			
20%	2,240	4	8,960
Return to Compliance	2,240	4	8,960
Periodic CCT Re-eval.	1,120	16	17,920
10%		Total	254,240

In-line POU Option for Systems with LSLs

Tracking			
# of systems	11,200	2	22,400
Review			
	11,200	6	67,200
Follow-up			
25%	2,800	4	11,200
Reporting			
	11,200	0.5	5,600
Violations			
20%	2,240	4	8,960
Return to Compliance	2,240	4	8,960
		Total	115,360

Default CCT Option
Assume no state review of default CCT - only review of system-demonstrated equivalence
Assume same system size triggers as above, with an assumed percentage (20%) using system-demonstrated equivalence
Assume 10% of CCT plans would need to be re-evaluated periodically

Option 1		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
20%	189	20	3,772
Follow-up			
25%	47	8	377
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Compliance	19	4	75
Periodic CCT			
Re-eval.	94	40	3,772
10%		Total	10,430

Option 2		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
20%	1,659	8	13,274
Follow-up			
25%	415	4	1,659
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to			
Compliance	1,659	4	6,637
Periodic CCT			
Re-eval.	830	16	13,274
10%		Subtotal	55,583
			10,430
		Total	66,013

Option 3		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
20%	14,131	4	56,526
Follow-up			
50%	7,066	2	14,131
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to			
Compliance	23,317	4	93,267
Periodic CCT			
Re-eval.	7,066	4	28,263
10%		Subtotal	462,097
			55,583
			10,430
		Total	528,110

Find-and-fix Option, with an assumed % of systems to find and fix exceedances of AL

	# of system:	% to fix	# of systems required for find and fix
All systems	79,896	30%	23,969

		Hours Ea.	Total Hours
Tracking			
# of systems	23,969	2	47,938
Review			
	23,969	4	95,875
Follow-up			
25%	5,992	4	23,969
Reporting			
	23,969	0.5	11,984
Violations			
2%	479	4	1,918
Return to			
Compliance	479	4	1,918
		Total	181,684

Total Corrosion Control Treatment

	Standard	Default	Find-and-Fix	Std. & FF	Default & FF
Option 1	44,943	10,430	181,684	226,627	192,113
Option 2	233,263	66,013	181,684	414,946	247,696
Option 3	1,048,644	528,110	181,684	1,230,328	709,793
Option 4	254,240		181,684	435,924	

In-Line POU	115,360

Public Education and Transparency

	# of systems
Large systems >50,000	943
Medium 3,301-50,000	8,296
Small 25-3,300	70,657
Total number of systems	79,896

Initial tracking, review and follow-up on water systems' public education and transparency plans
Assume systems with lead service lines (11,200) will have ongoing outreach with emphsis on homeowners with LSLs
Assume systems will provide notification to customers within 24 hours of exceedance of lead action level
Assume a small percentage of systems (20%) won't complete notifications and states will have to notify
Assume systems will make information accessible to customers on results of all tap samples and WQP sampling

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	943	2	1,886
Review			
	943	4	3,772
Follow-up			
10%	94	4	377
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Complianc	19	4	75
Periodic Plan			
Re-eval.	94	40	3,772
10%		Total	10,430

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systen	8,296	2	16,592
Review			
	8,296	3	24,888
Follow-up			
10%	830	2	1,659
Reporting			
	8,296	0.5	4,148
Violations			
5%	415	4	1,659
Return to			
Complianc	415	4	1,659
Periodic Plan			
Re-eval.	830	16	13,274
10%		Subtotal	63,879
			10,430
		Total	74,309

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systen	70,657	2	141,314
Review			
	70,657	2	141,314
Follow-up			
10%	7,066	2	14,131
Reporting			
	70,657	0.5	35,329
Violations			
10%	7,066	4	28,263
Return to			
Complianc	7,066	4	28,263
Periodic CCT			
Re-eval.	7,066	4	28,263
10%		Subtotal	416,876
			63,879
			10,430
		Total	491,185

WIIN Notifications

Assume states will make 20% of WIIN Notifications				20%							
Large Systems		Hours Ea.	Total Hours	Medium Systems		Hours Ea.	Total Hours	Small Systems		Hours Ea.	Total Hours
Notifications				Notifications				Notifications			
# of systen	189	4	754	# of systen	1,659	4	6,637	# of systen	14,131	4	56,526
										Total	63,917

Total for Public Eduction & Transparency	555,102

Tap Sampling

	Model Inputs
	Model Outputs

	# of systems	
Large systems >50,000	943	Complex Sampling Plans
Medium 3,301-50,000	8,296	Moderate Sampling Plans
Small 25-3,300	70,657	Simple Sampling Plans
Total number of systems	79,896	

Initial tracking, review and follow-up on sampling plans
Assume 10% of sampling plans would need to be re-evaluated periodically

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	943	2	1,886
Review			
	943	16	15,088
Follow-up			
15%	141	4	566
Reporting			
	943	0.5	472
Violations			
2%	19	4	75
Return to			
Compliance	19	4	75
Periodic Plan			
Re-eval.	830	8	6,637
10%		Total	24,799

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	8,296	2	16,592
Review			
	8,296	8	66,368
Follow-up			
25%	2,074	4	8,296
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	4	6,637
Return to			
Compliance	1,659	4	6,637
Periodic Plan			
Re-eval.	830	6	4,978
10%		Subtotal	113,655
			24,799
		Total	138,454

Small Systems		Hours Ea.	Total Hours
Tracking			
# of systems	70,657	2	141,314
Review			
	70,657	4	282,628
Follow-up			
40%	28,263	4	113,051
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	4	93,267
Return to			
Compliance	23,317	4	93,267
Periodic Plan			
Re-eval.	7,066	3	21,197
10%		Subtotal	780,053
			113,655
			24,799
		Total	918,507

Notification(s) of household action level exceedance

Initial tracking, review and follow-up on notification plans
Assume 10% of notification plans would need to be re-evaluated periodically

Large Systems	Hours Ea.	Total Hours	Medium Systems	Hours Ea.	Total Hours	Small Systems	Hours Ea.	Total Hours
Tracking			Tracking			Tracking		

# of systems	943	2	1,886
Review			
	943	4	3,772
Follow-up			
25%	236	2	472
Reporting			
	943	0.5	472
Violations			
2%	19	2	38
Return to			
Compliance	19	2	38
Periodic Plan			
Re-eval.	94	2	189
10%	Total		6,865

# of systems	8,296	2	16,592
Review			
	8,296	3	24,888
Follow-up			
25%	2,074	2	4,148
Reporting			
	8,296	0.5	4,148
Violations			
20%	1,659	2	3,318
Return to			
Compliance	1,659	2	3,318
Periodic Plan			
Re-eval.	830	2	1,659
10%		Subtotal	58,072
			6,865
		Total	64,937

# of systems	70,657	2	141,314
Review			
	70,657	2	141,314
Follow-up			
50%	35,329	2	70,657
Reporting			
	70,657	0.5	35,329
Violations			
33%	23,317	2	46,634
Return to			
Compliance	23,317	2	46,634
Periodic CCT			
Re-eval.	7,066	2	14,131
10%		Subtotal	496,012
			58,072
			6,865
		Total	560,949

Total Tap Sampling 1,479,457

Copper

(shaded)	**Model Inputs**
(shaded)	**Model Outputs**

	# of systems	Non-Corrosive	# of systems to sample for copper
Large systems >50,000	943	50%	472
Medium 3,301-50,000	8,296	50%	4,148
Small 25-3,300	70,657	50%	35,329
Total number of systems	79,896		

Initial tracking, review and follow-up on copper sampling plans
Assume the number of copper sampling sites would be half of lead sampling sites - state review time half of lead review
Assume 10% of sampling plans would need to be re-evaluated periodically

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	472	2	943
Review			
	472	12	5,658
Follow-up			
15%	71	4	283
Reporting			
	472	0.5	236
Violations			
2%	9	4	38
Return to			
Complianc	9	4	38
Periodic Plan			
Re-eval.	47	8	377
10%		Total	7,572

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	4,148	2	8,296
Review			
	4,148	6	24,888
Follow-up			
15%	622	4	2,489
Reporting			
	4,148	0.5	2,074
Violations			
20%	830	4	3,318
Return to			
Compliance	830	4	3,318
Periodic Plan			
Re-eval.	415	6	2,489
10%		Subtotal	46,872
			7,572
		Total	54,445

Small Systems		Hours Ea.	Total Hours
Tracking			
# of syster	35,329	2	70,657
Review			
	35,329	2	70,657
Follow-up			
25%	8,832	4	35,329
Reporting			
	35,329	0.5	17,664
Violations			
33%	11,658	4	46,634
Return to			
Complianc	11,658	4	46,634
Periodic Plan			
Re-eval.	3,533	3	10,599
10%		Subtotal	298,173
			46,872
			7,572
		Total	352,617

Initial tracking, review (simple), and follow-up for the other half of systems with non-corrosive water

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	472	2	943
Review			
	472	2	943

Medium Systems		Hours Ea.	Total Hours
Tracking			
# of systems	4,148	2	8,296
Review			
	4,148	2	8,296

Small Systems		Hours Ea.	Total Hours
Tracking			
# of syster	35,329	2	70,657
Review			
	35,329	2	70,657

Follow-up			
15%	71	2	141
Reporting			
	472	0.5	236
Violations			
2%	9	2	19
Return to			
Complianc	9	2	19
Periodic Plan			
Re-eval.	47	2	94
10%		Total	2,395

Follow-up			
15%	622	2	1,244
Reporting			
	4,148	0.5	2,074
Violations			
5%	207	2	415
Return to			
Compliance	207	2	415
Periodic Plan			
Re-eval.	415	2	830
10%		Subtotal	21,570
			2,395
		Total	23,965

Follow-up			
25%	8,832	2	17,664
Reporting			
	35,329	0.5	17,664
Violations			
15%	5,299	2	10,599
Return to			
Complianc	5,299	2	10,599
Periodic CCT			
Re-eval.	3,533	2	7,066
10%		Subtotal	204,905
			21,570
			2,395
		Total	228,870

Total for copper 581,487

ASDWA
Association of State Drinking Water Administrators

December 13, 2019

The Office of Management and Budget (OMB)
Eisenhower Executive Office Building
1650 Pennsylvania Avenue NW
Washington, DC 20503

Re: Proposed Lead and Copper Rule Revisions, Docket ID No. EPA-HQ-OW-2017-0300

Dear OMB Drinking Water Desk,

The Association of State Drinking Water Administrators (ASDWA) is the independent, nonpartisan, national organization representing the collective interests of the drinking water program administrators in the 50 states, five territories, the District of Columbia, and the Navajo Nation. ASDWA's members implement the Safe Drinking Water Act (SDWA) by regulating and providing technical assistance and funding for the nation's 150,000 public water systems (PWS) to ensure the protection of public health and the economy.

ASDWA's members are facing challenges from ongoing implementation of the 1991 Lead and Copper Rule (LCR) and will face additional challenges in implementing the proposed Lead and Copper Rule Revisions (LCRR). While the proposed LCRR will close several loopholes in the 1991 LCR and will certainly reduce exposure to lead in drinking water, the final LCRR will pose a significant burden to primacy agencies.

In response to EPA's LCR Federalism Consultation in 2018, ASDWA conducted a Costs of States' Transactions Study (CoSTS) that estimated that the increased workload from the anticipated revisions to the LCR would range from 3.8 million to 5.0 million staff hours in the first five years of implementation, or 760,000-1,000,000 staff hours annually. Given states' ongoing challenges in meeting EPA's requirements for the existing drinking water regulations, this is a significant increase. When translated to dollars, the costs of states' staff time for the LCRR would be in the range of 72% to 95% of current funding for the Public Water Supply Supervision (PWSS) program.

This potential increase to states' workload exacerbates the impacts of increased activities states have undertaken for non-regulated contaminants such as Per- and Polyfluoroalkyl Substances (PFAS) and *Legionella* as detailed in ASDWA's 2018 "Beyond Tight Budgets" report. For the 2018 report, ASDWA asked the states to estimate the hours required to meet the additional demands for these non-regulated contaminants. Of the 25 respondents, states have experienced workload increases ranging from 1.1% to 12.5%, with the average workload increase at 4.3%. Flat federal funding for the PWSS program for the past decade exacerbates the funding gap by another 20% due to inflation.

ASDWA is in the process of updating CoSTS to reflect the various requirements in the proposed LCRR. The proposed LCRR is an incredibly complex regulation, with multiple categories requiring significant interactions between the states (as the primacy agencies) and the public water system (PWSs). The CoSTS update involves a significant effort to estimate the number of PWSs that would be impacted by the proposed LCRR requirements, and the associated amount of time for states to notify them of the

LCRR requirements, track, review, and approve all submissions, provide technical assistance, notify systems that have missed submissions, and start enforcement actions for each of the categories listed below:

- Regulatory start-up;
- Lead service line inventories, replacement plans, and replacements;
- Tap sampling plans and tap sampling;
- Trigger level and action level exceedances;
- Corrosion control treatment, including water quality parameter monitoring;
- Sampling site assessment (called find-and-fix in the proposed LCRR);
- Small system flexibility;
- Change in source or treatment, and source water monitoring and treatment;
- Public notice (including 24-hour public notice), public education, and transparency;
- Lead testing in schools and child care facilities; and
- SDWIS, data tracking and primacy agency reporting.

ASDWA will submit the updated CoSTS as part of its comments by the end of the public comment period. It should be noted that while the current close of the public comment period is January 13, 2020, ASDWA has requested a 30-day extension to February 13, 2020 due to the complexity of the proposed LCRR.

Additionally, the last bullet in the above list (SDWIS, data tracking and primacy agency reporting) raises serious concerns for ASDWA and its members due to the complexity of the proposed LCRR. ASDWA is deeply concerned that increased state data management challenges have not been adequately addressed in this rule. For states to implement the LCRR, substantive planning and budget considerations need to be developed, in partnership with the states, for the upgrades to the existing data management systems (both at the EPA and state levels) for the additional LCRR reporting and recordkeeping requirements. ASDWA recommends that a commitment be made to develop an appropriate LCRR data management program (and start the development process) prior to promulgating the final LCRR.

Thank you for considering the perspective of state primacy agencies in finalizing the LCRR to ensure safe drinking water and public health protection. Please contact me at 730-812-9507 or aroberson@asdwa.org to provide more information or to ask questions.

Sincerely,

J. Alan Roberson

Alan Roberson, P.E., Executive Director
Association of State Drinking Water Administrators

Cc: David Ross – EPA OW
Jennifer McLain – EPA OGWDW
Eric Burneson – EPA OGWDW
Anita Thompkins – EPA OGWDW

Message

From: Deirdre White [dwhite@asdwa.org]
Sent: 11/12/2019 12:51:33 PM
To: Thompkins, Anita [Thompkins.Anita@epa.gov]; Bergman, Ronald [Bergman.Ronald@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]; Davis, CatherineM [Davis.CatherineM@epa.gov]
Subject: Question about WIIN Lead Notification Requirements?

Good morning,

Would one of you be able to help clarify the WIIN Act 24 hour public notification requirement for a community water system (CWS) lead action level (AL) exceedance for me this morning?

My question is whether the following language on the 24 public notification requirement for a CWS "lead AL exceedance" is for:

1. A CWS to notify its customers for a 90th percentile lead AL exceedance? or
2. A CWS to notify an individual household if the household sample exceeds the lead action level? or
3. Both?

I know the pre-pub version of the revised Lead and Copper rule includes both, but wanted to confirm that this was a requirement from WIIN.

TITLE II--WATER AND WASTE ACT OF 2016
Subtitle A--Safe Drinking Water
(Sec. 2106) (3)(D) see top of page 3 below - Notice that the public water system exceeded the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or notification in a successor regulation promulgated pursuant to section 1412)

Thanks in advance for your help,
Deirdre

Deirdre White (Mason), Project Manager
Association of State Drinking Water Administrators
Office: 703-812-4775
Ex. 6 Personal Privacy (PP)
Email: dwhite@asdwa.org
URL: www.asdwa.org
Twitter: @Deirdre_h2o

Message

From: Roberson, Alan [aroberson@asdwa.org]
Sent: 2/1/2018 2:17:17 PM
To: Mushkolaj, Iliriana [Mushkolaj.Iliriana@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]
CC: dosterhoudt@asdwa.org
Subject: Re: ASDWA-EPA LCR meeting on Friday, Feb. 2
Attachments: LCR State Questions.docx

Eric and Lisa and Illiriana, enclosed is a list of questions that Darrell put together for our discussions tomorrow. See you then. Alan

On Fri, Jan 26, 2018 at 7:58 AM, Roberson, Alan <aroberson@asdwa.org> wrote:

> Iliriana and Lisa and Eric, enclosed is a draft agenda for our LCR meeting with EPA next Friday - it's just a draft and I am amenable to some revisions next week, so let me know.
>
> And I did notice that conference call number was a 202 area code number and I would like to request a toll-free number if possible as we will be having several states calling in (as well as a handful attending in person).
>
> Thanks and have a good weekend. Alan
>
> ***********************************
> **J. Alan Roberson, P.E.**
> *Executive Director*
>
> **Association of State Drinking Water Administrators (ASDWA)**
> 1401 Wilson Blvd. - Suite 1225
> Arlington, VA 22209
>
> Office: (703) 812-9507

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****
J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

LCR Long Term Revisions - State Questions

Questions to clarify possible rule requirements and assist with preparing state comments and estimating resource needs

Lead Service Line Replacement

Inventory of lead service lines:

- Will all size systems be required to develop and submit?
- What is considered acceptable – records review, field checks, combination?
- How will systems that don't find LSL's be handled? Will there be any reevaluation?
- What level of review is expected of states?
- Will systems be required to post data for the public? What level of detail must be shared? Will that be dictated by system size? Can states host this data?

Proactive LSL replacement:

- How do systems with no LSL's opt out?
- Is there any minimum threshold that would mean some systems don't need a program?
- What time period will be allowed for total removal (% per year)?
- What if the system falls behind, i.e. any violations?
- What if private owners can't afford to participate?
- States will need to review each plan, but do they approve them or just log them in?
- States will need to review status reports. How often will they be submitted?

Partial LSL replacement:

- When will it be allowed?
- Will systems have to develop an SOP that states approve individually, or could some default be included that systems could follow (like a standard specification) to avoid extensive state reviews?

Filters:

- What monitoring of the filter distribution will be required – an individual certification like for consumer notice of sample results, some periodic report, or just a records review during a sanitary survey?

Corrosion Control Treatment

Targeting systems to install CCT:

- Will all systems be required to do an evaluation and develop a plan? If not, what criteria determines who does one – population, presence of LSLs, other?
- Will all systems be required to reevaluate on some schedule or just based on triggers (and what triggers)? Could it be based on some change in the 90th percentile like an increase of 10% or rising to half the Action Level?
- How to handle systems that are naturally noncorrosive without a need for additional treatment (and how do you measure/verify that)?

Providing POU devices to all homes with LSL:

- What documentation will states receive and review? Will systems report how many they have done, or when they are installed?

- How will states verify that the PWS is "maintaining" the device? Will it require some form of reporting with review, a check during the sanitary survey, or response to complaints?

Designating OCCT:

- Could there be a default OCCT which would be less work for systems to prepare and states to review?
- How will systems and states verify that OCCT is indeed working - Water Quality Parameters, tap sample results, coupon tests, other?
- Will the find and fix process mirror the RTCR process where states have a responsibility to review the report and track the response of the system?
- What level triggers the find and fix requirement? A single sample (above the Action Level or the Household Action Level) or some increase in the 90^{th} percentile?

Transparency and Public Education

- How will systems report what outreach they have done and what level of review will be required?
- Will states have to approve individual documents or just provide examples systems can use? Will the initial products be developed by EPA?
- How will systems make tap sample results available to consumers? Will they be required to post on the internet? Can states provide this service, especially if they already post sample results on a state site (Drinking Water Watch)?

LCR Tap Sampling

- What will be the new site selection criteria?
- If customer requests are the new normal, how many will be required? Will there be any minimum or maximum number?
- What sampling protocol will be used – first draw, normal use, other?
- Will states need to review and approve monitoring plans?
- Will other samples collected outside the established monitoring plan be included in the 90^{th} percentile?
- What will be the criteria for invalidating samples?
- How would EPA establish a household action level? What would be the system's responsibility and what would be the state's when the action level is exceeded? How much system reporting and state tracking will be required? What responsibility will state DW programs have for assuring that the state/local Health Department responds appropriately?

Copper

Screen for aggressive water:

- Can EPA establish criteria for the aggressive nature of the water – a matrix?
- Are the parameters easy and cheap to measure, even for small systems?
- How often would the monitoring need to be done to confirm the status – ongoing WQPs, periodic reassessment, other?
- If the water is aggressive what can systems do – monitoring, OCCT, PE, other? What is the state's role in reviewing, approving, monitoring the system's approach?

Tap sampling for Copper:

- Will some level of tap sampling be required, regardless of the aggressiveness determination?
- How many additional sites will be required? Is there going to be a minimum number of sites even for nonaggressive water? Might lead and copper both still be analyzed even for targeted lead or targeted copper sites?
- What will be the criteria for invalidating samples?

Other issues

- Will the action level of 15 be maintained?

Message

From: Roberson, Alan [aroberson@asdwa.org]
Sent: 2/23/2017 9:59:27 PM
To: Burneson, Eric [Burneson.Eric@epa.gov]
Subject: Draft minutes from Tuesdays' call
Attachments: Minutes from ASDWA Board Conference Call 02212017.docx

Eric, I just called and left a message as I was hoping you could take a couple of minutes and look thru these draft minutes from Tuesday to make sure I got down what you said right...

Alan

****
J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

<u>Minutes from ASDWA Board Conference Call</u>
<u>Tuesday, February 22nd at 2:45 PM</u>

In Attendance:
ASDWA staff– Alan Roberson, Executive Director
Darrell Osterhoudt
Deirdre Mason
EPA - Eric Burneson
ASDWA Board – Randy Ellingboe, President
Cindy Christian
Dan Czecholinski
Howie Isaacs
Doug Kinard
Lori Daniels
Lori Mathieu
Stephanie Stinger
Beth Messer
Greg Wavra
Roger Sokol

1. Alan Roberson convened the meeting, conducted a roll call and turned the meeting over to Eric Burneson from EPA OGWDW.
2. Eric reaffirmed that the ASDWA Board wanted to discuss priorities within EPA's Drinking Water Action Plan – Eric repeated the priorities from ASDWA's comments on the Plan and that led to discussions on a few regulatory issues.
3. Infrastructure funding – will the SRF be the tool of choice for more funding? Nobody knows for sure at this point and several policy directions for EPA will unfold in the future. EPA, like others, is waiting on the details of its budget and other financial issues.
4. The Long-Term Revisions to the Lead and Copper Rule (LTR-LCR) – EPA could brief the EPA Administrator for decision-making on regulatory options if the Assistant Administrator for Water is not in place to keep the schedule for proposal in 2017. The Assistant Administrator for Water is typically in place in the summer and can vary from early summer to late summer.
5. A question was raised on what the next 90 days with the new Administration might look like? Eric responded with three issues that the EPA "beachhead team" asked several questions about (noting that the full complement of political appointees being in place is still a ways out):
    a. The LTR-LCR and Flint
    b. Infrastructure funding
    c. PFOA and PFOS – EPA Administrator Pruitt was asked several questions about these during his confirmation hearings.
6. A question was raised about the 24-hour consumer notice in WIIN based on an exceedance and the expectation for privacy? Eric responded that the legislation requires EPA to develop a strategic plan in 180 days to address this issue and to consult with states and water systems. Another question was raised on whether this WIIN provision applied to all contaminants or just lead *(note that a copy of the relevant section of WIIN is*

enclosed and this notification provision only applies to exceedances of the lead action level).

7. Eric summarized his take-aways from EPA Administrator Pruitt's talk to Agency staff the morning of the 22nd and Pruitt emphasized three areas:
    a. How are regulations are important to make things predictable
    b. The importance of the rule of law
    c. Federalism matters
8. After Eric's departure from the conference call, the Board discussed a few logistical items for the March Board Meeting.

Message

From: Roberson, Alan [aroberson@asdwa.org]
Sent: 6/22/2018 3:40:00 PM
To: Burneson, Eric [Burneson.Eric@epa.gov]
CC: Rodgers-Jenkins, Crystal [Rodgers-Jenkins.Crystal@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]
Subject: LT-LCR Materials Inventories
Attachments: ASDWAs Recommended Revisions to the Existing LCR Regulatory Language 06222018 Final.docx

Eric, glad we were able to catch up a bit yesterday and can you send me the website for the hikes in the U.K.? It might be the National Paths site that I found yesterday but am not sure.

So enclosed is what we have come up with for language for materials inventories for the LT-LCR. There are a few things such as waivers that warrant some discussions as well as a couple of others that I posed as questions. But I got some great input from the Board over the past month and I hope it will be helpful to you and Crystal and Lisa.

I am going to be at EPA a couple of times next week if you want to talk. I have a meeting with Dave Ross on Tuesday at 4 and then the WDD meeting Wednesday - so either before or after those or next Friday the 29th is also pretty open. Have a good weekend. Alan

****
J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

Potential Revisions to the Existing Regulatory Language for the Lead and Copper Rule

§ 141.42 Special monitoring for corrosivity characteristics.

(a)-(c) [Reserved]

(d) Community water supply [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=9041faf1ffe29392107e76e91e631946&term_occur=2&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:E:141.42" \o "systems"] shall identify as part of a complete materials inventory, whether the following construction materials are present in their distribution [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=9041faf1ffe29392107e76e91e631946&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:E:141.42" \o "system"] and report to the State:

Lead from piping, ~~solder, caulking,~~ interior lining of distribution mains, caulking, service lines, goosenecks, and pigtails and, if readily available, other appurtenances, solder, and home plumbing that could contain lead~~alloys and home plumbing~~.
Copper from piping and alloys, service lines, and if readily available, home plumbing.
Galvanized piping, service lines, and if readily available, home plumbing.
Ferrous piping materials such as cast iron and steel.
Asbestos cement pipe.

(i) The inventory shall include the following data elements for each account:
   a. Address and/or Geographic Information System (GIS) data, if available.
   b. Service line materials for both the portion of the service line owned by the water systems and the portion owned by the property owner.
   c. Data source for the information in the above part (b).

(ii) The inventory shall include a narrative that discusses how the inventory was developed and the use of any indicators such as general property construction timeframes, decades where areas were constructed that would provide some probability of lead service lines and/or lead solder being used in construction, as well as physical evaluation of pipe materials~~,~~ and customer surveys. This narrative shall also include a schedule for reducing the number of unknown service line materials.~~the use of indicators such as general property construction timeframes, decades where areas were constructed that would provide some probability of lead service lines and/or lead solder being used in construction, physical evaluation of pipe materials, and customer surveys.~~

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In addition, [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=f6eacd9e7984ddacf706213108506e27&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:E:141.42" \o "States"] may require identification and reporting of other materials of construction present in distribution [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=9041faf1ffe29392107e76e91e631946&term_occur=3&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:E:141.42" \o "systems"] that may contribute [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=6ed3ac469d0691488a2a13fbf54d624a&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:E:141.42" \o "contaminants"] to the drinking water, such as:

Vinyl lined asbestos cement pipe.
Coal tar lined pipes and tanks.

Also need to add in a reference to 141.86(a)(below) and some reference for sharing the inventory with the public through posting on the system's website (allowing for some alternative, when approved by the state, for small systems) and adding a statement in 141.154 for the Consumer Confidence Report (CCR) that the report is available.

A waiver process will be needed for the initial materials inventory if a newer (maybe post-1960?) system (housing subdivision, consecutive system, trailer park, etc.) can certify that they do not have any Tier I sites and their prior or initial monitoring data resulted in a 90th percentile value less than a certain percentage (maybe 50% or maybe less than 5 ppb?) of the Action Level. If the system has a source change, the system would have to redo their initial monitoring to ensure that the change did not affect the chemistry, etc.

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[[HYPERLINK "https://www.law.cornell.edu/rio/citation/45_FR_57346" \o "45 FR 57346"], Aug. 27, 1980; [HYPERLINK "https://www.law.cornell.edu/rio/citation/47_FR_10999" \o "47 FR 10999"], Mar. 12, 1982, as amended at [HYPERLINK "https://www.law.cornell.edu/rio/citation/59_FR_62470" \o "59 FR 62470"], Dec. 5, 1994]

§ 141.86 Monitoring requirements for lead and copper in tap water.

(a)*Sample site location.*

(1) WithinBy three (3) years after the applicable date ~~for commencement of monitoring under~~ of this regulation~~paragraph (d)(1) of this section~~, each water system shall develop~~complete~~ a complete materials inventory~~evaluation~~ of its distribution system. Based on this inventory, water systems shall ~~in order to~~ identify a pool of targeted sampling sites that meets the requirements of this section, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.86" \l "c" \o "paragraph (c)"] of this section. All sites from which [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=431704a0e89858d95e47831e098f58d9&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.86" \o "first draw samples"] are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=e10007e8eff98313f180678be60e17a9&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.86" \o "point-of-entry treatment devices"] designed to remove inorganic contaminants.

(2) A water system shall use the information on lead, copper, and galvanized steel that it is required to collect under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.42" \l "d" \o "§ 141.42(d)"] of this part [special monitoring for corrosivity characteristics] when conducting a materials inventory~~evaluation~~. When an evaluation of the information collected pursuant to § 141.42(d) is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in paragraph (a) of this section, the water system shall review the sources of information listed below in order to identify a sufficient number of sampling sites. In addition, the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities):

(i) All plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system;

(ii) All inspections and records of the distribution system that indicate the material composition of the[HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=874aa54d14aa17b965c7d71035ce466b&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.86" \o "service connections"] that connect a structure to the distribution system; and

(iii) All existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations.

Distribution system materials inventories to be updated every three (3) years if revisions/changes are made to the inventory. Otherwise, systems can certify that no new information affecting the inventory has become available in the previous three years.

Balance of 141.86 remains the same -- skip to 141.90 reporting requirements.

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§ 141.90 Reporting requirements.

All water systems shall report all of the following information to the [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=f6eacd9e7984ddacf706213108506e27&term_occur=1&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.90" \o "State"] in accordance with this section.

(a)*Reporting requirements for distribution system materials inventory*

(1)A water systems shall submit the distribution systems materials inventory that it is required to collect under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.42" \l "d" \o "§ 141.42(d)"] of this part [special monitoring for corrosivity characteristics].

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(b~~a~~)*Reporting requirements for tap water monitoring for lead and copper and for water quality parameter monitoring.*

(1) Except as provided in [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.90" \l "a_1_viii" \o "paragraph (a)(1)(viii)"] of this section, a water system shall report the information specified below for all tap water samples specified in § 141.86 and for all water quality parameter samples specified in § 141.87 within the first 10 days following the end of each applicable monitoring period specified in § 141.86 and § 141.87 (*i.e.,* every six months, annually, every 3 years, or every 9 years). For monitoring periods with a duration less than six months, the end of the monitoring period is the last date samples can be collected during that period as specified in [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.86" \o "§§ 141.86"] and 141.87.

(i) The results of all tap samples for lead and copper including the location of each site and the criteria under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.86" \l "a" \o "§ 141.86(a)"] (3), (4), (5), (6), and/or (7) under which the site was selected for the system's sampling pool;

(ii) Documentation for each tap water lead or copper sample for which the water system requests invalidation pursuant to [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.86" \l "f_2" \o "§ 141.86(f)(2)"];

(iii) [Reserved]

(iv) The 90th percentile lead and copper concentrations measured from among all lead and copper tap water samples collected during each monitoring period (calculated in accordance with [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.80" \l "c_3" \o "§ 141.80(c)(3)"]), unless the [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=f6eacd9e7984ddacf706213108506e27&term_occur=2&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.90" \o "State"] calculates the system's 90th percentile lead and copper levels under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.90" \l "h" \o "paragraph (h)"] of this section;

(v) With the exception of initial tap sampling conducted pursuant to [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.86" \l "d_1" \o "§ 141.86(d)(1)"], the system shall designate any site which was not sampled during previous monitoring periods, and include an explanation of why sampling sites have changed;

(vi) The results of all tap samples for pH, and where applicable, alkalinity, calcium, conductivity, temperature, and orthophosphate or silica collected under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.87" \o "§ 141.87"] (b)-(e);

(vii) The results of all samples collected at the entry point(s) to the distribution system for applicable water quality parameters under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.87" \o "§ 141.87"](b)-(e);

(viii) A water system shall report the results of all water quality parameter samples collected under [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.87" \l "c" \o "§ 141.87(c)"] through (f) during each six-month monitoring period specified in [HYPERLINK "https://www.law.cornell.edu/cfr/text/40/141.87" \l "d" \o "§ 141.87(d)"] within the first 10 days following the end of the monitoring period unless the [HYPERLINK "https://www.law.cornell.edu/definitions/index.php?width=840&height=800&iframe=true&def_id=f6eacd9e7984ddacf706213108506e27&term_occur=3&term_src=Title:40:Chapter:I:Subchapter:D:Part:141:Subpart:I:141.90" \o "State"] has specified a more frequent reporting requirement.

Message

From: Alan Roberson [aroberson@asdwa.org]
Sent: 3/2/2020 7:21:23 PM
To: Helm, Erik [Helm.Erik@epa.gov]
CC: Wendi Wilkes [wwilkes@asdwa.org]; Kevin Letterly [kletterly@asdwa.org]; Christ, Lisa [Christ.Lisa@epa.gov]; Burneson, Eric [Burneson.Eric@epa.gov]
Subject: Re: A few additional questions on ASDWA LCR comments
Attachments: Final CoSTS 2-6-20.xlsx

Erik, enclosed is the final CoSTS model for your review. Take a dive into it and compile a list of questions so that we can try and have answers when we meet later this month.

The seven states that conduct compliance monitoring are:

- Arkansas
- Delaware
- Louisiana
- Mississippi
- Missouri
- North Dakota
- South Carolina

I am assuming that conduct the monitoring for all systems regardless of size but will check into that as well as getting some details about whether the states do soup-to-nuts for testing (which I think is the case but don't know for sure) or just a portion of it. Will pass on the answers once I get them from the above stats.

Alan

J. Alan Roberson, P.E.
Executive Director
Association of State Drinking Water Administrators (ASDWA)
Office (Direct) - (703) 812-9507
Cell - (703) 915-4385
Email: aroberson@asdwa.org

Twitter @AlanTheWaterMan

From: Helm, Erik <Helm.Erik@epa.gov>
Sent: Thursday, February 27, 2020 9:56 AM
To: Alan Roberson <aroberson@asdwa.org>
Subject: A few additional questions on ASDWA LCR comments

Alan,

A few other questions related to your comments on the LCR. Could you provide EPA with the list of states that cover sampling costs for systems (and for which systems, like systems serving under 3,300 people)? And, if not to much trouble the list of specific costs covered by the states for example do they cover collection costs, sampling bottles, lab costs, notification to customers, etc.

Could you also provide clarification on your estimate that 20% of small systems and NTNCWS would utilize the "flexibility" option, is this 20% are going to select POU or LSLR instead of CCT? Also, how did you arrive at 20%?

Thanks,
erik

Erik C. Helm, Ph.D.
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Fax: 202-564-3760

Costs of States Transactions Study (CoSTS) for EPA's Proposed LCRR
Association of State Drinking Water Administrators (ASDWA)
2/6/20 Version

The summary below is based on the eight categories taken from EPA's Proposed LCRR

Regulatory Start-Up

Lead Service Line Inventory and Replacment (LSLR)

Tap Sampling

Trigger Level (TL)

Corrosion Control Treatment (CCT)

Sample Site Assessment

Public Notification and Education

Lead Testing in Schools and Child Care Facilities

Totals

Current LCR Hours (2018)

Increased Hours from LCRR

Annual Increased Hours

The total hours are estimated for the first five years of the LCRR
Five years is assumed to be an appropriate timeframe for the first cycle of states and systems adopting and complying with the LCRR
All totals are being shown as whole numbers
For the number of systems, this model uses data from SDWIS downloaded on 11/8/19

76,166 times 5 Years

(Total from first five years)

(Each year for the first five years)

Estimated staff hours from EPA proposal	Estimated staff hours ASDWA proposal	Estimated staff hours saved with revisions
582,100	563,970	18,130
1,174,898	990,708	184,190
1,232,103	1,232,103	-
147,526	147,526	-
476,961	481,977	(5,016)
154,449	96,581	57,868
354,395	354,395	-
435,458	190,057	245,401
4,557,889	4,057,317	500,572
380,830	380,830	
4,177,059	3,676,487	
835,412	735,297	

Regulatory Start-Up

(shaded)	Model Inputs
(shaded)	Model Outputs

Hours for each activity rounded up from Revised Total Coliform Rule (RCTR)

Adoption of Lead and Copper Rule Revisions (LCRR)

States	Hours Ea.	Total Hours
49	3,200	156,800

Modify State Data Management System

Unclear how the modernized SDWIS might accommodate LCRR and what state changes might be needed

States	Hours Ea.	Total Hours
49	3,700	181,300

System Training and Technical Assistance

States	Hours Ea.	Total Hours
49	4,000	196,000

State Staff Training

Assume three categories for training for state staff to properly trained on all components of LCRR

Lead service line inventories & replacement, corrosion control treatment, public education, sampling & simultaneous compliance

		Hours Ea.	Total Hours
Large	9	2,000	18,000
Medium	20	1,000	20,000
Small	20	500	10,000
Total	49		48,000

Not Wyoming or DC

This total for state staff training is in the same range as what was estimated for the Revised Total Coliform Rule (RTCR)

Total Regulatory Start-Up 582,100

Lead Service Line (LSL) Inventories and Replacement Plans

	# of systems	NTNCWS	Systems with LSLs		
Large systems >50,000	1,006	2	503		Complex LSL Inventories & LSLR Plans
Medium 3,301-50,000	8,349	197	4,175		Moderate LSL Inventories & LSLR Plans
Small 25-3,300	40,304	17352	10,076		Simpler LSL Inventories & LSLR Plans
Total number of systems	49,659		14,754	Total number of systems with LSLs	

Initial tracking, review and follow-up for LSL inventories - complexity of inventories based on system size and whether system has LSLs or not

Assume all systems have to conduct an inventory to determine if they have LSLs or not
Assume review of systems with LSLs will take more time than systems that don't have LSLs

Assume 100% of LSL inventories would need to be re-evaluated annually.

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Assumes large NTNCWS are not included due to less than 1 being reported for having LSLs based off Exhibit 4-17 in EPA's Economic Analysis
Assumes 30% of all CWSs will have LSLs - 50% of large and medium CWSs and 25% of small CWSs have LSLs

Lead Service Line Inventories-First inventory after first three years plus two annual re-evaluations in years four and five

Large Systems with LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		503	2	1,006
Review				
		503	8	4,024
Follow-up				
	15%	75	4	302
Reporting				
		503	0.5	252
Violations				
	2%	10	4	40
Return to				
Compliance		10	4	40
Annual LSLI				
Re-evaluation		1,006	8	8,048
	200%		Total	13,712

Medium Sys. with LSLs			Hours Ea.
Tracking			
# of systems		4,175	2
Review			
		4,175	8
Follow-up			
	25%	1,044	4
Reporting			
		4,175	0.5
Violations			
	20%	835	4
Return to			
Compliance		835	4
Annual LSLI			
Re-evaluation		8,349	8
	200%		Subtotal
		19,411	Total

Large Systems without LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		503	2	1,006
Review				
		503	2	1,006
Follow-up				
	10%	50	2	101
Reporting				
		503	0.5	252
Violations				
	2%	10	2	20
Return to				
Compliance		10	2	20
			Total	2,404

Medium Sys. without LSLs			Hours Ea.
Tracking			
# of systems		4,175	2
Review			
		4,175	2
Follow-up			
	10%	417	2
Reporting			
		4,175	0.5
Violations			
	10%	417	2
Return to			
Compliance		417	2
			Subtotal
			Total

Model Inputs
Model Outputs

Systems without LSLs	
503	
4,175	
30,228	
34,906	Total no. of systems without LSLs

For NTNCWS Using Exhibit 4-17 2.5% assumption

0
5
434

Total Hours	Small Sys. with LSLs			Hours Ea.	Total Hours
	Tracking				
8,349	# of systems		10,076	2	20,152
	Review				
33,396			10,076	4	40,304
	Follow-up				
4,175		40%	4,030	4	16,122
	Reporting				
2,087			10,076	0.5	5,038
	Violations				
3,340		33%	3,325	4	13,300
	Return to				
3,340	Compliance		3,325	4	13,300
	Annual LSLI				
66,792	Re-evaluation		20,152	4	80,608
121,478		200%		Subtotal	188,824
13,712					121,478
135,190					13,712
				Total	324,014

NTNCWS with LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		439	2	877
Review				
		439	4	1,755
Follow-up				
	40%	175	4	702
Reporting				
		439	0.5	219
Violations				
	33%	145	4	579
Return to				
Compliance		145	4	579
Annual LSLI				
Re-evaluation		877	4	3,510
	200%		Subtotal	8,222
				188,824
				121,478
				13,712
			Total	332,236

Total Hours	Small Sys. without LSLs			Hours Ea.	Total Hours
	Tracking				
8,349	# of systems		30,228	2	60,456
	Review				
8,349			30,228	2	60,456
	Follow-up				
835		20%	6,046	2	12,091
	Reporting				
2,087			30,228	0.5	15,114
	Violations				
835		20%	6,046	2	12,091
	Return to				
835	Compliance		6,046	2	12,091
21,290				Subtotal	172,300
2,404					21,290
23,694					2,404
				Total	195,994

Small NTNCWS without LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		16,918	2	33,836
Review				
		16,918	2	33,836
Follow-up				
	40%	6,767	2	13,535
Reporting				
		16,918	0.5	8,459
Violations				
	33%	5,583	2	11,166
Return to				
Compliance		5,583	2	11,166
Periodic LSLI				
Plan Re-eval.		5,075	3	15,226
	30%		Subtotal	127,225
				207,580
				27,969
				3,551
			Total	366,325

Medium/Large NTNCWS without LSLs			Hours Ea.
Tracking			
# of systems		194	2
Review			
		194	2
Follow-up			
	40%	78	2
Reporting			
		194	0.5
Violations			
	33%	64	2
Return to			
Compliance		64	2
Periodic LSLR			
Plan Re-eval.		58	3
	30%		Subtotal
			Total

Total Hours
388
388
155
97
128
128
175
1,459
196,926
207,580
27,969
3,551
437,485

Lead Service Line Replacement Plans-First plan after first three years plus two annual re-evaluations in years four and five

Assume LSLR plans would need to be re-evaluated on a periodic basis

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially
Assume 5% of systems initially without LSLs find a few LSLs in the system that were unknown but found via main breaks, etc.

Assumes the following are included in the LSLR plan review process:

communication plan, procedures for coordinating full LSLR, a funding strategy, a pitcher filter tracking and maintenance plan, and for CWSs that serve >10,000 pe

Large Systems			Hours Ea.	Total Hours
Tracking				
# of systems		528	2	1,056
Review				
		528	18	9,507
Negotiation of goals				
		528	8	4,225
Follow-up				
	10%	53	4	211
Reporting				
		528	0.5	264
Violations				
	2%	11	4	42
Return to				
Compliance		11	4	42
Periodic LSLR				
Plan Re-eval.		1,056	4	4,225
	200%	Total		19,573

Medium Systems			Hours Ea.
Tracking			
# of systems		4,383	2
Review			
		4,383	10
Negotiation of goals			
		4,383	8
Follow-up			
	10%	438	4
Reporting			
		4,383	0.5
Violations			
	20%	877	4
Return to			
Compliance		877	4
Periodic LSLR			
Plan Re-eval.		8,766	3
	200%		Subtotal
			Total

		Additonal LSL systems (5%)		Also assume 5% for NTNCWS
		Large	25	22
		Medium	209	
		Small	1,511	

ople

Total Hours	Small Systems			Hours Ea.	Total Hours
	Tracking				
8,766	# of systems		11,587	2	23,175
	Review				
43,832			11,587	6	69,524
	Negotiation of goals				
35,066			11,587	8	92,699
	Follow-up				
1,753		25%	2,897	4	11,587
	Reporting				
2,192			11,587	0.5	5,794
	Violations				
3,507		33%	3,824	4	15,295
	Return to				
3,507	Compliance		3,824	4	15,295
	Periodic LSLR				
26,299	Plan Re-eval.		23,175	1	23,175
124,922		200%		Subtotal	256,545
19,573					124,922
144,495					19,573
				Total	401,040

NTNCWS with LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		461	2	921
Review				
		461	6	2,764
Negotiation of goals				
		461	8	3,685
Follow-up				
	40%	184	4	737
Reporting				
		461	0.5	230
Violations				
	33%	152	4	608
Return to				
Compliance		152	4	608
Periodic LSLR				
Plan Re-eval.		921	1	921
	200%		Subtotal	10,475
				256,545
				124,922
				13,235
			Total	405,177

Total LSL Replacement and Inventory	1,174,898

Tap Sampling

	# of systems	
Large systems >50,000	1,008	Complex Sampling Plans
Medium 3,301-50,000	8,546	Moderate Sampling Plans
Small 25-3,300	57,656	Simple Sampling Plans
Total number of systems	67,210	

Model Inputs
Model Outputs

Assume based on Exhibit 5-28 in EPA's Economic Analysis showing minimum sample number that because more samples are being taken more time spent reviewing

Assume review includes ensuring system used accurate sample sites and followed new protocol for providing instructions and making results available within 60 days

Assume more follow-up will be needed as system size decreases
Assume violations increase as system size decreases
Assume 99% of NTNCWS with LSL will fall under the small system size and 1% of the NTNCWS with LSL will fall under medium system size
Assume NTNCWS without LSL are added to CWS based on size
Assume hours spent on systems without LSL are less in all aspects
Assume that this includes both lead and copper tap sampling

Review of Monitoring Data

Large Systems			Hours Ea.	Total Hours
Tracking				
# of systems		1,008	2	2,016
Review				
		1,008	8	8,064
Follow-up				
	15%	151	4	605
Reporting				
		1,008	0.5	504
Violations				
	2%	20	4	81
Return to				
Compliance		20	4	81
			Total	11,350

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		8,546	2	17,092
Review				
		8,546	8	68,368
Follow-up				
	25%	2,137	4	8,546
Reporting				
		8,546	0.5	4,273
Violations				
	20%	1,709	4	6,837
Return to				
Compliance		1,709	4	6,837
			Subtotal	111,953
				11,350
			Total	123,303

Small Systems			Hours Ea
Tracking			
# of systems		57,656	
Review			
		57,656	
Follow-up			
	40%	23,062	
Reporting			
		57,656	0
Violations			
	33%	19,026	
Return to			
Compliance		19,026	
			Subtotal
			Total

Review of Compliance Monitoring Plans Based on LSL Inventories

Large Systems with LSL			Hours Ea.	Total Hours
Tracking				
# of systems		528	2	1,056
Review				
		528	10	5,282
Follow-up				
	15%	79	4	317
Reporting				
		528	0.5	264
Violations				
	2%	11	4	42
Return to				
Compliance		11	4	42
Plan				
Re-eval.		454	8	3,629
	90%		Total	10,632

Medium Systems with LSL			Hours Ea.	Total Hours
Tracking				
# of systems		4,388	2	8,776
Review				
		4,388	8	35,103
Follow-up				
	25%	1,097	4	4,388
Reporting				
		4,388	0.5	2,194
Violations				
	20%	878	4	3,510
Return to				
Compliance		878	4	3,510
Plan				
Re-eval.		3,949	6	23,694
	90%		Subtotal	81,175
				10,632
			Total	91,807

Small Systems with LSL			Hours Ea
Tracking			
# of systems		12,043	
Review			
		12,043	
Follow-up			
	40%	4,817	
Reporting			
		12,043	0
Violations			
	33%	3,974	
Return to			
Compliance		3,974	
Plan			
Re-eval.		10,839	
	90%		Subtotal
			Total

Review of Compliance Monitoring Plans Based on LSL Inventories

Large Systems without LSL			Hours Ea.	Total Hours
Tracking				
# of systems		503	1	503
Review				
		503	3	1,509
Follow-up				
	15%	75	2	151
Reporting				
		503	0.5	252
Violations				
	2%	10	2	20
Return to				
Compliance		10	2	20
Plan				
Re-eval.		151	3	453
	30%		Total	2,907

Medium Systems without LSL			Hours Ea.	Total Hours
Tracking				
# of systems		192	1	192
Review				
		192	2	384
Follow-up				
	25%	48	2	96
Reporting				
		192	0.5	96
Violations				
	20%	38	2	77
Return to				
Compliance		38	2	77
Plan				
Re-eval.		58	2	115
	30%		Subtotal	1,037
				2,907
			Total	3,944

Small Systems without LSL			Hours Ea
Tracking			
# of systems		47,146	
Review			
		47,146	
Follow-up			
	40%	18,858	
Reporting			
		47,146	0
Violations			
	33%	15,558	
Return to			
Compliance		15,558	
Plan			
Re-eval.		14,144	
	30%		Subtotal
			Total

Tap Sampling Total

Trigger Level (TL)

	Model Inputs	Trigger Level (TL)
	Model Outputs	Action Level (AL)

	# of systems	CWS	NTNCWS
Large systems >50,000	1,008	1,006	2
Medium 3,301-50,000	8,546	8,349	197
Small 25-3,300	57,656	40,304	17,352
Total number of systems	67,210		

Assume states will use the latest two rounds of LCR Compliance Monitoring for trigger level determination, using the higher 90th percentile

Assume based on Exhibit 4-22 in EPA Economic Analysis that 19% of all systems will be above TL

% of systems that will be above AL and TL will increase once LSL inventories are completed & compliance monitoring locations are revised

The 19% includes the AL and TL percentages and these can be combined because workload is similar

Assume this is a one time process to help prepare individual systems for their status under the new rule - in

Reaction to TLE and ALE under routine monitoring is covered by actions under many other tabs

Some of the systems will need additional follow up due to issues with historical data and other problems

All systems		Hours Ea.	Total Hours
Tracking			
# of systems	67,210	1	67,210
Review			
	67,210	1	67,210
Reporting			
	12,770	0.5	6,385
Periodic			
Follow-up	6,721	1	6,721
10%		Total	147,526

Corrosion Control Treatment

	# of systems	CWS
Large systems >50,000	1,008	1,006
Medium 3,301-50,000	8,546	8,349
Small 25-3,300	57,656	40,304
Total number of systems	67,210	

Assumes systems with CCT that exceed TL and AL have the same workload.
Assume there will be no large systems without CCT that must conduct CCT study or complete CCT installation

Assume percentages based off exhibit 4-22 in EPA's Economic Analysis

Assume 33% of medium systems (2820 systems) will have TLE or ALE

Option 1	Large No CCT TL	0
Option 2	Medium No CCT TL	65%
Option 3	Large with CCT	50%
Option 4	Medium with CCT	88%
Option 5	Large No CCT AL	0
Option 6	Medium No CCT AL	35%

Option 1			Hours Ea.	Total Hours
Tracking # of systems		-	2	-
Review		-	40	-
Follow-up	25%	-	10	-
Reporting		-	1	-
Violations	2%	-	6	-
Return to Compliance		-	4	-
Periodic CCT Re-eval.		-	40	-
	10%	Subtotal		-

Option 5			Hours Ea.	Total Hours
Tracking # of systems		-	2	-
Review		-	32	-
Follow-up	25%	-	4	-
Reporting		-	1	-
Violations	2%	-	6	-
Return to Compliance		-	4	-
Periodic CCT Re-eval.		-	32	-
	10%	Subtotal		-

		Model Inputs
NTNCWS		**Model Outputs**
	2	
	197	
	17,352	

Must conduct study
Must conduct study
reoptimize
reoptimize
complete cct installation
complete cct installation

Option 2			Hours Ea.	Total Hours
Tracking				
# of systems		1,833	2	3,666
Review				
		1,833	20	36,660
Follow-up				
	25%	458	10	4,583
Reporting				
		1,833	1	1,833
Violations				
	20%	367	6	2,200
Return to				
Compliance		367	4	1,466
Periodic CCT				
Re-eval.		183	20	3,666
	10%		Subtotal	54,074

Option 3			Hours Ea.	Total Hours
Tracking				
# of systems		504	2	1,008
Review				
		504	40	20,160
Follow-up				
	25%	126	10	1,260
Reporting				
		504	1	504
Violations				
	2%	10	6	60
Return to				
Compliance		10	4	40
Periodic CCT				
Re-eval.		50	40	2,016
	10%		Subtotal	25,049

Option 4			Hours Ea.	Total Hours
Tracking				
# of systems		2,482	2	4,963
Review				
		2,482	20	49,632
Follow-up				
	25%	620	10	6,204
Reporting				
		2,482	1	2,482
Violations				
	20%	496	6	2,978
Return to				
Compliance		496	4	1,985
Periodic CCT				
Re-eval.		248	20	4,963
	10%		Subtotal	73,207

Option 6			Hours Ea.	Total Hours
Tracking				
# of systems		987	2	1,974
Review				
		987	20	19,740
Follow-up				
	25%	247	10	2,468
Reporting				
		987	1	987
Violations				
	20%	197	6	1,184
Return to				
Compliance		197	4	790
Periodic CCT				
Re-eval.		99	20	1,974
	10%		Subtotal	29,117

CCT Option Total	181,446

Small System Flexibility

Assumes percentages above for CCT based on EPA Economic Analysis

Assumes 20% small systems and NTNCWS do Small System Flexibility

3% LSLR

10% CCT

8% reoptimizing CCT

2% installing CCT

6% POU

Assumes majority (80%) NTNCWS will do Lead Bearing Option with remaing 20% distributed evenly in other 4 categories

5% of NTNCWS added to total NTNCWS in small size category

LSL		3%		
Small Sys. with LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		2,077	2	4,153
Review				
		2,077	4	8,307
Follow-up				
	40%	831	4	3,323
Reporting				
		2,077	0.5	1,038
Violations				
	33%	685	4	2,741
Return to				
Compliance		685	4	2,741
Periodic LSLR				
Plan Re-eval.		623	3	1,869
	30%		Subtotal	24,173

Reoptimizing CCT			8%	
		Hours Ea.		Total Hours
Tracking				
# of systems		4,092	2	8,184
Review				
		4,092	4	16,368
Follow-up				
	50%	2,046	4	8,184
Reporting				
		4,092	0.5	2,046
Violations				
	33%	1,350	4	5,401
Return to Compliance		1,350	4	5,401
Periodic CCT Re-eval.		409	4	1,637
	10%	Subtotal		47,221

Installing CCT			2%	
		Hours Ea.		Total Hours
Tracking				
# of systems		1,674	2	3,347
Review				
		1,674	8	13,389
Follow-up				
	50%	837	4	3,347
Reporting				
		1,674	0.5	837
Violations				
	33%	552	4	2,209
Return to Compliance		552	4	2,209
Periodic CCT Re-eval.		167	4	669
	10%	Subtotal		26,009

POU	6%		
	Hours Ea.		Total Hours
Tracking			
# of systems	3,286	2	6,572
Review			
	3,286	4	13,143
Follow-up			
50%	1,643	4	6,572
Reporting			
	3,286	0.5	1,643
Violations			
33%	1,084	4	4,337
Return to Compliance	1,084	4	4,337
Periodic CCT Re-eval.	329	4	1,314
10%	Subtotal		37,919

NTNCWS Lead Bearing				80% NTNCWS
			Hours Ea.	Total Hours
Tracking				
# of systems		13,882	2	27,763
Review				
		13,882	4	55,526
Follow-up				
	50%	6,941	4	27,763
Reporting				
		13,882	0.5	6,941
Violations				
	33%	4,581	4	18,324
Return to Compliance		4,581	4	18,324
Periodic CCT Re-eval.		1,388	4	5,553
	10%	Subtotal		160,194
Small System Flexibility Total				295,515
CCT and Small System Flexibility Total				476,961

Sample Site Assessment

		# of systems	% to fix	# of systems required for find and fix
All systems		67,210	30%	20,163

			Hours Ea.	Total Hours
Tracking				
# of systems		20,163	2	40,326
Review				
		20,163	4	80,652
Follow-up				
	25%	5,041	4	20,163
Reporting				
		20,163	0.5	10,082
Violations				
	2%	403	4	1,613
Return to Compliance		403	4	1,613
			Total	154,449

Model Inputs
Model Outputs

Public Notification and Education

	Model Inputs
	Model Outputs

	total # of systems	# systems with ALE	# systems with LSL/sites >AL
Large systems >50,000	1,008	175	723
Medium 3,301-50,000	8,546	855	3,991
Small 25-3,300	57,656	5,016	6,746
Total number of systems	67,210	6,046	11,459

All systems will need review/assistance for general outreach materials and states will track certifications for delivery of lead results and annual outreach to local health agencies

Initial tracking, review and follow-up on water systems' public education plans for systems with ALE, including Tier 1 PN
Initial tracking, review and follow-up on water systems' transparency plans and actions for systems with LSLs and individual homes >AL
EPA's Economic Analysis used for the percentages for systems with ALEs
Assume CCR changes will be handled within normal CCR activities with no significant additional burden

Assistance and review for all systems

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	1,008	0.5	504
Review/assistance			
	1,008	4	4,032
Follow-up			
10%	101	4	403
Reporting			
	1,008	0.5	504
Violations			
2%	20	1	20
Return to Compliance	20	2	40
Periodic Plan Re-eval.	101	2	202
10%		Total	5,705
	2,258		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		8,546	0.5	4,273
Review/assistance				
		8,546	3	25,638
Follow-up				
	10%	855	2	1,709
Reporting				
		8,546	0.5	4,273
Violations				
	5%	427	1	427
Return to Compliance		427	2	855
Periodic Plan Re-eval.		855	1.5	1,282
	10%		Subtotal	38,457
				5,705
		19,082	Total	44,162

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		57,656	0.5	28,828
Review/assistance				
		57,656	2	115,312
Follow-up				
	10%	5,766	2	11,531
Reporting				
		57,656	0.5	28,828
Violations				
	10%	5,766	1	5,766
Return to Compliance		5,766	2	11,531
Periodic Plan Re-eval.		5,766	1	5,766
	10%		Subtotal	207,562
				38,457
		169,578		5,705
			Total	251,724

Transparency for systems with LSLs or sites >AL

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	175	2	351
Review			
	175	4	702
Follow-up			
10%	18	4	70
Reporting			
	175	0.5	88
Violations			
2%	4	4	14
Return to Compliance	4	4	14
Periodic Plan Re-eval.	18	2	35
10%		Total	1,273
	393		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		855	2	1,709
Review				
		855	3	2,564
Follow-up				
	10%	85	2	171
Reporting				
		855	0.5	427
Violations				
	5%	43	4	171
Return to Compliance		43	4	171
Periodic Plan Re-eval.		85	1.5	128
	10%		Subtotal	5,341
				1,273
		19,082	Total	6,615

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		5,016	2	10,032
Review				
		5,016	2	10,032
Follow-up				
	10%	502	2	1,003
Reporting				
		5,016	0.5	2,508
Violations				
	10%	502	4	2,006
Return to Compliance		502	4	2,006
Periodic Plan Re-eval.		502	1	502
	10%		Subtotal	28,090
				5,341
		169,578		1,273
			Total	34,705

Full PE/PN for ALE

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systems	723	2	1,445
Review			
	723	4	2,891
Follow-up			
10%	72	4	289
Reporting			
	723	0.5	361
Violations			
2%	14	4	58
Return to Compliance	14	4	58
Periodic Plan Re-eval.	72	2	145
10%		Total	5,247
	1,619		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		3,991	2	7,982
Review				
		3,991	3	11,973
Follow-up				
	10%	399	2	798
Reporting				
		3,991	0.5	1,995
Violations				
	5%	200	4	798
Return to Compliance		200	4	798
Periodic Plan Re-eval.		399	1.5	599
	10%		Subtotal	24,944
				5,247
		19,082	Total	30,191

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		6,746	2	13,492
Review				
		6,746	2	13,492
Follow-up				
	10%	675	2	1,349
Reporting				
		6,746	0.5	3,373
Violations				
	10%	675	4	2,698
Return to Compliance		675	4	2,698
Periodic Plan Re-eval.		675	1	675
	10%		Subtotal	37,776
				24,944
		169,578		5,247
			Total	67,967

Total for Public Eduction & Transparency 354,395

Lead Testing in Schools and Child Care Facilities

Assume the number of hours per state includes the following:

Ongoing conversations with systems on number of licensed schools and child care
(Dept. of Ed., Dept of Social Services, etc.), providing updated guidance

States		Hours Ea.	Total Hours	
	49	1,000	49,000	
Total number of systems				67210
Initial tech. assistance		67,210	3	201,630
Tracking # of systems		67,210	0.5	33,605
Review		67,210	1	67,210
Follow-up	15%	10,082	1	10,082
Reporting		67,210	1	67,210
Violations	10%	6,721	0.5	3,361
Return to Compliance		6,721	0.5	3,361
			Total	386,458
Lead Testing in Schools Total				435,458

Model Inputs
Model Outputs

e facilities in their area, coordinating with other entities

Regulatory Start-Up

	Model Inputs
	Model Outputs

Hours for each activity rounded up from Revised Total Coliform Rule (RCTR)

Adoption of Lead and Copper Rule Revisions (LCRR)

States	Hours Ea.	Total Hours
49	3,200	156,800

Modify State Data Management System

Assumes that accepting ASDWA recommendations for SDWIS State will reduce staff hours by 10% from proposal

States	Hours Ea.	Total Hours
49	3,330	163,170

System Training and Technical Assistance

States	Hours Ea.	Total Hours
49	4,000	196,000

State Staff Training

Assume three categories for training for state staff to properly trained on all components of LCRR

Lead service line inventories & replacement, corrosion control treatment, public education, sampling & simultaneous compliance

			Hours Ea.	Total Hours
	Large	9	2,000	18,000
	Medium	20	1,000	20,000
	Small	20	500	10,000
Not Wyoming or DC	Total	49		48,000

This total for state staff training is in the same range as what was estimated for the Revised Total Coliform Rule (RTCR)

Total Regulatory Start-Up 563,970

Lead Service Line (LSL) Inventories and Replacement Plans

	# of systems	NTNCWS	Systems with LSLs	
Large systems >50,000	1,006	2	503	
Medium 3,301-50,000	8,349	197	4,175	
Small 25-3,300	40,304	17352	10,076	
Total number of systems	49,659		14,754	Total number of systems with LSLs

Initial tracking, review and follow-up for LSL inventories - complexity of inventories based on system size and whether system has LSLs or not

Assume all systems have to conduct an inventory to determine if they have LSLs or not
Assume review of systems with LSLs will take more time than systems that don't have LSLs

Assumes all systems with LSLs would have LSL inventories re-evaluated annually

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially

Assumes all systems without LSLsL would be to be re-evaluated once based on reduced monitoring (every three years) in the first five years of the LCRR
Assumes large NTNCWS are not included due to less than 1 being reported for having LSLs based off Exhibit 4-17 in EPA's Economic Analysis
Assumes 30% of all CWS will have LSLs
Assume 5% reduction of small and NTNCWS with LSLs based on ASDWA's comments

Large Systems with LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		503	2	1,006
Review				
		503	8	4,024
Follow-up				
	15%	75	4	302
Reporting				
		503	0.5	252
Violations				
	2%	10	4	40
Return to				
Compliance		10	4	40
Periodic LSL				
Inv. Re-eval.		503	12	6,036
	100%		Total	11,700

Medium Sys. with LSLs		
Tracking		
# of systems		4,175
Review		
		4,175
Follow-up		
	25%	1,044
Reporting		
		4,175
Violations		
	20%	835
Return to		
Compliance		835
Periodic LSLR		
Plan Re-eval.		4,175
	100%	
		15,237

Large Systems without LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		503	2	1,006
Review				
		503	2	1,006
Follow-up				
	10%	50	2	101
Reporting				
		503	0.5	252
Violations				
	2%	10	2	20
Return to				
Compliance		10	2	20
			Total	2,404

Medium Sys. without LSLs		
Tracking		
# of systems		4,175
Review		
		4,175
Follow-up		
	10%	417
Reporting		
		4,175
Violations		
	10%	417
Return to		
Compliance		417
	30%	

	Model Inputs
	Model Outputs

	Systems without LSLs		For NTNCWS Using Exhibit 4-17 2.5% assumption
Complex LSL Inventories & LSLR Plans	503		0
Moderate LSL Inventories & LSLR Plans	4,175		5
Simpler LSL Inventories & LSLR Plans	30,228		434
	34,906	Total no. of systems without LSLs	

	Hours Ea.	Total Hours
	2	8,349
	8	33,396
	4	4,175
	0.5	2,087
	4	3,340
	4	3,340
	8	33,396
Subtotal		88,082
		11,700
Total		99,782

Small Sys. with LSLs			Hours Ea.	Total Hours
Tracking # of systems		9,572	2	19,144
Review		9,572	4	38,289
Follow-up	40%	3,829	4	15,316
Reporting		9,572	0.5	4,786
Violations	33%	3,159	4	12,635
Return to Compliance		3,159	4	12,635
Periodic LSLR Plan Re-eval.		9,572	4	38,289
	100%		Subtotal	141,094
				88,082
				11,700
			Total	240,876

NTNCWS with LSLs			Hours Ea.	Total Hours
Tracking # of systems		417	2	834
Review		417	4	1,667
Follow-up	40%	167	4	667
Reporting		417	0.5	208
Violations	33%	138	4	550
Return to Compliance		138	4	550
Periodic LSLR Plan Re-eval.		417	4	1,667
	100%		Subtotal	6,143
				141,094
				88,082
				11,700
			Total	247,019

	Hours Ea.	Total Hours
	2	8,349
	2	8,349
	2	835
	0.5	2,087
	2	835
	2	835
Subtotal		21,290
		2,404
Total		23,694

Small Sys. without LSLs			Hours Ea.	Total Hours
Tracking # of systems		30,228	2	60,456
Review		30,228	2	60,456
Follow-up	20%	6,046	2	12,091
Reporting		30,228	0.5	15,114
Violations	20%	6,046	2	12,091
Return to Compliance		6,046	2	12,091
			Subtotal	172,300
				21,290
				2,404
			Total	195,994

Small NTNCWS without LSLs			Hours Ea.	Total Hours
Tracking # of systems		16,918	2	33,836
Review		16,918	2	33,836
Follow-up	40%	6,767	2	13,535
Reporting		16,918	0.5	8,459
Violations	33%	5,583	2	11,166
Return to Compliance		5,583	2	11,166
Periodic LSLR Plan Re-eval.		5,075	3	15,226
	30%		Subtotal	127,225
				207,580
				27,969
				3551
			Total	366,325

Medium/Large NTNCWS without LSLs			Hours Ea.	Total Hours
Tracking				
# of systems		194	2	388
Review				
		194	2	388
Follow-up				
	40%	78	2	155
Reporting				
		194	0.5	97
Violations				
	33%	64	2	128
Return to				
Compliance		64	2	128
Periodic LSLR				
Plan Re-eval.		58	3	175
	30%		Subtotal	1,459
				196,926
				207,580
				27,969
				3551
			Total	437,485

Assume 100% of systems with LSLs develop LSLR plans based on the respective required annual replacement percentages (3% or 7%)
Assume zero hours for goal-based replacement rates
Assume LSLR plans would need to be re-evaluated periodically

Systems would find more LSLs than in original inventory or find a few LSLs in the system that were unknown initially
Assume 5% of systems initially without LSLs find a few LSLs in the system that were unknown but found via main breaks, etc.

Assumes the following are included in the LSLR plan review process:

Communication plan, procedures for coordinating full LSLR, a funding strategy, a pitcher filter tracking and maintenance plan,

Large Systems			Hours Ea.	Total Hours
Tracking				
# of systems		528	2	1,056
Review				
		528	18	9,507
Follow-up				
	10%	53	4	211
Reporting				
		528	0.5	264
Violations				
	2%	11	4	42
Return to				
Compliance		11	4	42
Periodic LSLR				
Plan Re-eval.		528	8	4,225
	100%		Total	15,348

Medium Systems		
Tracking		
# of systems		4,383
Review		
		4,383
Follow-up		
	10%	438
Reporting		
		4,383
Violations		
	20%	877
Return to		
Compliance		877
Periodic LSLR		
Plan Re-eval.		4,383
	100%	

Additonal LSL systems (5%)	
Large	25
Medium	209
Small	1,511

Also assume 5% for NTNCWS	21

and for CWSs that serve >10,000 people

Hours Ea.	Total Hours
2	8,766
10	43,832
4	1,753
0.5	2,192
4	3,507
4	3,507
8	35,066
Subtotal	98,623
	15,348
Total	113,971

Small Systems			Hours Ea.	Total Hours
Tracking # of systems		11,587	2	23,175
Review		11,587	6	69,524
Follow-up	25%	2,897	4	11,587
Reporting		11,587	0.5	5,794
Violations	33%	3,824	4	15,295
Return to Compliance		3,824	4	15,295
Periodic LSLR Plan Re-eval.		11,587	4	46,350
	100%		Subtotal	187,021
				98,623
				15,348
			Total	300,991

NTNCWS with LSLs			Hours Ea.	Total Hours
Tracking # of systems		438	2	875
Review		438	6	2,626
Follow-up	40%	175	4	700
Reporting		438	0.5	219
Violations	33%	144	4	578
Return to Compliance		144	4	578
Periodic LSLR Plan Re-eval.		438	4	1,751
	100%		Subtotal	7,326
				187,021
				98,623
				13,235
			Total	306,204

Total LSL Replacement and Inventory 990,708

Tap Sampling

	Model Inputs
	Model Outputs

	# of systems	
Large systems >50,000	1,008	Complex Sampling Plans
Medium 3,301-50,000	8,546	Moderate Sampling Plans
Small 25-3,300	57,656	Simple Sampling Plans
Total number of systems	67,210	

Assume based on Exhibit 5-28 in EPA's Economic Analysis showing minimum sample number that because more samples are being taken more time spent reviewing

Assume review includes ensuring system used accurate sample sites and followed new protocol for providing instructions and making results available within 60 days

Assume more follow-up will be needed as system size decreases
Assume violations increase as system size decreases
Assume 99% of NTNCWS with LSL will fall under the small system size and 1% of the NTNCWS with LSL will fall under medium system size
Assume NTNCWS without LSL are added to CWS based on size
Assume hours spent on systems without LSL are less in all aspects
Assume that this includes both lead and copper tap sampling

Review of Monitoring Data

Large Systems			Hours Ea.	Total Hours
Tracking				
# of systems		1,008	2	2,016
Review				
		1,008	8	8,064
Follow-up				
	15%	151	4	605
Reporting				
		1,008	1	504
Violations				
	2%	20	4	81
Return to Compliance		20	4	81
			Total	11,350

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		8,546	2	17,092
Review				
		8,546	8	68,368
Follow-up				
	25%	2,137	4	8,546
Reporting				
		8,546	0.5	4,273
Violations				
	20%	1,709	4	6,837
Return to Compliance		1,709	4	6,837
			Subtotal	111,953
				11,350
			Total	123,303

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		57,656	2	115,312
Review				
		57,656	4	230,624
Follow-up				
	40%	23,062	4	92,250
Reporting				
		57,656	0.5	28,828
Violations				
	33%	19,026	4	76,106
Return to Compliance		19,026	4	76,106
			Subtotal	619,225
				111,953
				11,350
			Total	742,528

Review of Compliance Monitoring Plans Based on LSL Inventories

Large Systems with LSL Tracking		Hours Ea.	Total Hours
# of systems	528	2	1,056
Review			
	528	10	5,282
Follow-up			
15%	79	4	317
Reporting			
	528	0.5	264
Violations			
2%	11	4	42
Return to Compliance Plan	11	4	42
Re-eval.	454	8	3,629
90%		Total	10,632

Medium Systems with LSL Tracking			Hours Ea.	Total Hours
# of systems		4,388	2	8,776
Review				
		4,388	8	35,103
Follow-up				
	25%	1,097	4	4,388
Reporting				
		4,388	0.5	2,194
Violations				
	20%	878	4	3,510
Return to Compliance Plan		878	4	3,510
Re-eval.		3,949	6	23,694
	90%		Subtotal	81,175
				10,632
			Total	91,807

Small Systems with LSL Tracking			Hours Ea.	Total Hours
# of systems		12,043	2	24,087
Review				
		12,043	4	48,174
Follow-up				
	40%	4,817	4	19,270
Reporting				
		12,043	0.5	6,022
Violations				
	33%	3,974	4	15,897
Return to Compliance Plan		3,974	4	15,897
Re-eval.		10,839	3	32,517
	90%		Subtotal	161,864
				81,175
				10,632
			Total	253,671

Review of Compliance Monitoring Plans Based on LSL Inventories

Large Systems without LSL Tracking		Hours Ea.	Total Hours
# of systems	503	1	503
Review			
	503	3	1,509
Follow-up			
15%	75	2	151
Reporting			
	503	0.5	252
Violations			
2%	10	2	20
Return to Compliance Plan	10	2	20
Re-eval.	151	3	453
30%		Total	2,907

Medium Systems without LSL Tracking			Hours Ea.	Total Hours
# of systems		192	1	192
Review				
		192	2	384
Follow-up				
	25%	48	2	96
Reporting				
		192	0.5	96
Violations				
	20%	38	2	77
Return to Compliance Plan		38	2	77
Re-eval.		58	2	115
	30%		Subtotal	1,037
				2,907
			Total	3,944

Small Systems without LSL Tracking			Hours Ea.	Total Hours
# of systems		47,146	1	47,146
Review				
		47,146	1	47,146
Follow-up				
	40%	18,858	2	37,717
Reporting				
		47,146	0.5	23,573
Violations				
	33%	15,558	2	31,116
Return to Compliance Plan		15,558	2	31,116
Re-eval.		14,144	1	14,144
	30%		Subtotal	231,959
				1,037
				2,907
			Total	235,903

Tap Sampling Total 1,232,103

Trigger Level (TL)

	Model Inputs	Trigger Level (TL)
	Model Outputs	Action Level (AL)

	# of systems	CWS	NTNCWS
Large systems >50,000	1,008	1,006	2
Medium 3,301-50,000	8,546	8,349	197
Small 25-3,300	57,656	40,304	17,352
Total number of systems	67,210		

Assume states will use the latest two rounds of LCR Compliance Monitoring for trigger level determination, using the higher 90th percentile

Assume based on Exhibit 4-22 in EPA Economic Analysis that 19% of all systems will be above TL

% of systems that will be above AL and TL will increase once LSL inventories are completed & compliance monitoring locations are revised

The 19% includes the AL and TL percentages and these can be combined because workload is similar

Assume this is a one time process to help prepare individual systems for their status under the new rule - in addition to generic training covered in the

Reaction to TLE and ALE under routine monitoring is covered by actions under many other tabs

Some of the systems will need additional follow up due to issues with historical data and other problems

All systems		Hours Ea.	Total Hours
Tracking			
# of systems	67,210	1	67,210
Review			
	67,210	1	67,210
Reporting			
	12,770	0.5	6,385
Periodic			
Follow-up	6,721	1	6,721
10%		Total	147,526

Corrosion Control Treatment

	# of systems	CWS
Large systems >50,000	1,008	1,006
Medium 3,301-50,000	8,546	8,349
Small 25-3,300	57,656	40,304
Total number of systems	67,210	

Assumes systems with CCT that exceed TL and AL have the same workload
Assume that 10% of large systems without CCT that must conduct CCT study or complete CCT installation

Assume percentages based off exhibit 4-22 in EPA's Economic Analysis

Assume 33% of medium systems (2820 systems) will have TLE or ALE

Option 1	Large No CCT TL	10%
Option 2	Medium No CCT TL	65%
Option 3	Large with CCT	50%
Option 4	Medium with CCT	88%
Option 5	Large No CCT AL	0
Option 6	Medium No CCT AL	35%

Option 1			Hours Ea.	Total Hours
Tracking				
# of systems		101	2	202
Review				
		101	40	4,040
Follow-up				
	25%	25	10	250
Reporting				
		101	1	101
Violations				
	2%	2	6	12
Return to				
Compliance		2	4	8
Periodic CCT				
Re-eval.		10	40	400
	10%		Subtotal	5,012

Option 5			Hours Ea.	Total Hours
Tracking				
# of systems		0	2	0
Review				
		0	32	0
Follow-up				
	25%	0	4	0
Reporting				
		0	1	0
Violations				
	2%	0	4	0
Return to				
Compliance		0	4	0
Periodic CCT				
Re-eval.		0	32	0
	10%		Subtotal	0

		Model Inputs
NTNCWS		Model Outputs
	2	
	197	
	17,352	

Must conduct study
Must conduct study
reoptimize
reoptimize
complete cct installation
complete cct installation

Option 2			Hours Ea.	Total Hours
Tracking				
# of systems		1,833	2	3,666
Review				
		1,833	20	36,660
Follow-up				
	25%	458	10	4,583
Reporting				
		1,833	1	1,833
Violations				
	20%	367	6	2,200
Return to Compliance		367	4	1,466
Periodic CCT Re-eval.		183	20	3,666
	10%	Subtotal		54,074

Option 3			Hours Ea.	Total Hours
Tracking				
# of systems		504	2	1,008
Review				
		504	40	20,160
Follow-up				
	25%	126	10	1,260
Reporting				
		504	1	504
Violations				
	2%	10	6	60
Return to Compliance		10	4	44
Periodic CCT Re-eval.		50	40	2,016
	10%	Subtotal		25,052

Option 4			Hours Ea.	Total Hours
Tracking				
# of systems		2,482	2	4,963
Review				
		2,482	20	49,632
Follow-up				
	25%	620	10	6,204
Reporting				
		2,482	1	2,482
Violations				
	20%	496	6	2,978
Return to Compliance		496	4	1,985
Periodic CCT Re-eval.		248	20	4,963
	10%	Subtotal		73,207

Option 6			Hours Ea.	Total Hours
Tracking				
# of systems		987	2	1,974
Review				
		987	20	19,740
Follow-up				
	25%	247	10	2,468
Reporting				
		987	1	987
Violations				
	20%	197	6	1,184
Return to Compliance		197	4	790
Periodic CCT Re-eval.		99	20	1,974
	10%	Subtotal		29,117

CCT Option Total 186,462

Small System Flexibility

Assumes percentages above for CCT based on EPA Economic Analysis

Assumes 20% small systems and NTNCWS do Small System Flexibility

3% LSLR

10% CCT

8% reoptimizing CCT

2% installing CCT

6% POU

Assumes majority (80%) NTNCWS will do Lead Bearing Option with remaing 20% distributed evenly in other 4 categories

5% of NTNCWS added to total NTNCWS in small size category

LSL		3%		
Small Sys. with LSLs			Hours Ea.	Total Hours
Tracking # of systems		2,077	2	4,153
Review		2,077	4	8,307
Follow-up	40%	831	4	3,323
Reporting		2,077	0.5	1,038
Violations	33%	685	4	2,741
Return to Compliance		685	4	2,741
Periodic LSLR Plan Re-eval.		623	3	1,869
	30%		Subtotal	24,173

Reoptimizing CCT			8%	
			Hours Ea.	Total Hours
Tracking				
# of systems		4,092	2	8,184
Review				
		4,092	4	16,368
Follow-up				
	50%	2,046	4	8,184
Reporting				
		4,092	0.5	2,046
Violations				
	33%	1,350	4	5,401
Return to				
Compliance		1,350	4	5,401
Periodic CCT				
Re-eval.		409	4	1,637
	10%		Subtotal	47,221

Installing CCT			2%	
			Hours Ea.	Total Hours
Tracking				
# of systems		1,674	2	3,347
Review				
		1,674	8	13,389
Follow-up				
	50%	837	4	3,347
Reporting				
		1,674	0.5	837
Violations				
	33%	552	4	2,209
Return to				
Compliance		552	4	2,209
Periodic CCT				
Re-eval.		167	4	669
	10%		Subtotal	26,009

POU		6%		
			Hours Ea.	Total Hours
Tracking				
# of systems		3,286	2	6,572
Review				
		3,286	4	13,143
Follow-up				
	50%	1,643	4	6,572
Reporting				
		3,286	0.5	1,643
Violations				
	33%	1,084	4	4,337
Return to				
Compliance		1,084	4	4,337
Periodic CCT				
Re-eval.		329	4	1,314
	10%		Subtotal	37,919

NTNCWS Lead Bearing				80% NTNCWS
			Hours Ea.	Total Hours
Tracking				
# of systems		13,882	2	27,763
Review				
		13,882	4	55,526
Follow-up				
	50%	6,941	4	27,763
Reporting				
		13,882	0.5	6,941
Violations				
	33%	4,581	4	18,324
Return to				
Compliance		4,581	4	18,324
Periodic CCT				
Re-eval.		1,388	4	5,553
	10%		Subtotal	160,194

Small System Flexibility Total	295,515
CCT and Small System Flexibility Total	481,977

Sample Site Assessment

Assume lower hours due to reduced reporting requirements and what state has to review as described in ASDWA comments

All systems

Tracking		
# of systems		20,163
Review		
		20,163
Follow-up		
	25%	5,041
Reporting		
		20,163
Violations		
	2%	403
Return to Compliance		403

	Model Inputs
	Model Outputs

# of systems	% to fix	# of systems required for find and fix
67,210	30%	20,163

Hours Ea.	Total Hours
2	40,326
2	40,326
1	5,041
0.5	10,082
1	403
1	403
Total	96,581

Public Notification and Education

	Model Inputs
	Model Outputs

	total # of systems	# systems with ALE	# systems with LSL/sites >AL
Large systems >50,000	1,008	175	723
Medium 3,301-50,000	8,546	855	3,991
Small 25-3,300	57,656	5,016	6,746
Total number of systems	67,210	6,046	11,459

All systems will need review/assistance for general outreach materials and states will track certifications for delivery of lead results and annual outreach to local health agencies

Initial tracking, review and follow-up on water systems' public education plans for systems with ALE, including Tier 1 PN
Initial tracking, review and follow-up on water systems' transparency plans and actions for systems with LSLs and individual homes >AL
EPA's Economic Analysis used for the percentages for systems with ALEs
Assume CCR changes will be handled within normal CCR activities with no significant additional burden

Assistance and review for all systems

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	1,008	0.5	504
Review/assistance			
	1,008	4	4,032
Follow-up			
10%	101	4	403
Reporting			
	1,008	0.5	504
Violations			
2%	20	1	20
Return to			
Complianc	20	2	40
Periodic Plan			
Re-eval.	101	2	202
10%		Total	5,705
	2,258		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		8,546	0.5	4,273
Review/assistance				
		8,546	3	25,638
Follow-up				
	10%	855	2	1,709
Reporting				
		8,546	0.5	4,273
Violations				
	5%	427	1	427
Return to				
Compliance		427	2	855
Periodic Plan				
Re-eval.		855	1.5	1,282
	10%		Subtotal	38,457
				5,705
		19,082	Total	44,162

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		57,656	0.5	28,828
Review/assistance				
		57,656	2	115,312
Follow-up				
	10%	5,766	2	11,531
Reporting				
		57,656	0.5	28,828
Violations				
	10%	5,766	1	5,766
Return to				
Compliance		5,766	2	11,531
Periodic Plan				
Re-eval.		5,766	1	5,766
	10%		Subtotal	207,562
				38,457
		169,578		5,705
			Total	251,724

Transparency for systems with LSLs or sites >AL

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	175	2	351
Review			
	175	4	702
Follow-up			
10%	18	4	70
Reporting			
	175	0.5	88
Violations			
2%	4	4	14
Return to			
Complianc	4	4	14
Periodic Plan			
Re-eval.	18	2	35
10%		Total	1,273
	393		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		855	2	1,709
Review				
		855	3	2,564
Follow-up				
	10%	85	2	171
Reporting				
		855	0.5	427
Violations				
	5%	43	4	171
Return to				
Compliance		43	4	171
Periodic Plan				
Re-eval.		85	1.5	128
	10%		Subtotal	5,341
				1,273
		19,082	Total	6,615

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		5,016	2	10,032
Review				
		5,016	2	10,032
Follow-up				
	10%	502	2	1,003
Reporting				
		5,016	0.5	2,508
Violations				
	10%	502	4	2,006
Return to				
Compliance		502	4	2,006
Periodic Plan				
Re-eval.		502	1	502
	10%		Subtotal	28,090
				5,341
		169,578		1,273
			Total	34,705

Full PE/PN for ALE

Large Systems		Hours Ea.	Total Hours
Tracking			
# of systen	723	2	1,445
Review			
	723	4	2,891
Follow-up			
10%	72	4	289
Reporting			
	723	0.5	361
Violations			
2%	14	4	58
Return to			
Complianc	14	4	58
Periodic Plan			
Re-eval.	72	2	145
10%		Total	5,247
	1,619		

Medium Systems			Hours Ea.	Total Hours
Tracking				
# of systems		3,991	2	7,982
Review				
		3,991	3	11,973
Follow-up				
	10%	399	2	798
Reporting				
		3,991	0.5	1,995
Violations				
	5%	200	4	798
Return to				
Compliance		200	4	798
Periodic Plan				
Re-eval.		399	1.5	599
	10%		Subtotal	24,944
				5,247
		19,082	Total	30,191

Small Systems			Hours Ea.	Total Hours
Tracking				
# of systems		6,746	2	13,492
Review				
		6,746	2	13,492
Follow-up				
	10%	675	2	1,349
Reporting				
		6,746	0.5	3,373
Violations				
	10%	675	4	2,698
Return to				
Compliance		675	4	2,698
Periodic Plan				
Re-eval.		675	1	675
	10%		Subtotal	37,776
				24,944
		169,578		5,247
			Total	67,967

Total for Public Eduction & Transparency	354,395

Lead Testing in Schools and Child Care Facilities

Assumes "upon request" approach to lead testing in schools and child care facilities
Assume staff hours by states with the "upon request" option is 36.5% of proposed option
Assume review includes:

Reviewing system analysis of schools and sending sampling annual report

States		Hours Ea.	Total Hours	
	49	1,000	49,000	
Total number of systems				67210
Initial tech. assistance		24,532	3	73,595
Tracking # of systems		24,532	0.5	12,266
Review		24,532	1	24,532
Follow-up	15%	3,680	1	3,680
Reporting		24,532	1	24,532
Violations	10%	2,453	0.5	1,227
Return to Compliance		2,453	0.5	1,227
			Total	141,057
Lead Testing in Schools Total				190,057

Model Inputs
Model Outputs

kits, provide 3Ts guidance to each facility, submit

Message

From: Burneson, Eric [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=2CACB9A8D49F49AF80531E9E2CCB9018-EBURNESO]
Sent: 2/24/2017 2:20:23 PM
To: Roberson, Alan [aroberson@asdwa.org]
Subject: RE: Draft minutes from Tuesdays' call
Attachments: Minutes from ASDWA Board Conference Call 02212017egb.docx

Alan
Thanks for the opportunity to look these over. One clarification regarding the WIIN requirements for notification is in the attached.
Eric

From: Roberson, Alan [mailto:aroberson@asdwa.org]
Sent: Thursday, February 23, 2017 4:59 PM
To: Burneson, Eric <Burneson.Eric@epa.gov>
Subject: Draft minutes from Tuesdays' call

Eric, I just called and left a message as I was hoping you could take a couple of minutes and look thru these draft minutes from Tuesday to make sure I got down what you said right...

Alan

****
J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

Minutes from ASDWA Board Conference Call
Tuesday, February 22nd at 2:45 PM

In Attendance:

ASDWA staff– Alan Roberson, Executive Director
Darrell Osterhoudt
Deirdre Mason
EPA - Eric Burneson
ASDWA Board – Randy Ellingboe, President
Cindy Christian
Dan Czecholinski
Howie Isaacs
Doug Kinard
Lori Daniels
Lori Mathieu
Stephanie Stinger
Beth Messer
Greg Wavra
Roger Sokol

1. Alan Roberson convened the meeting, conducted a roll call and turned the meeting over to Eric Burneson from EPA OGWDW.
2. Eric reaffirmed that the ASDWA Board wanted to discuss priorities within EPA's Drinking Water Action Plan – Eric repeated the priorities from ASDWA's comments on the Plan and that led to discussions on a few regulatory issues.
3. Infrastructure funding – will the SRF be the tool of choice for more funding? Nobody knows for sure at this point and several policy directions for EPA will unfold in the future. EPA, like others, is waiting on the details of its budget and other financial issues.
4. The Long-Term Revisions to the Lead and Copper Rule (LTR-LCR) – EPA could brief the EPA Administrator for decision-making on regulatory options if the Assistant Administrator for Water is not in place to keep the schedule for proposal in 2017. The Assistant Administrator for Water is typically in place in the summer and can vary from early summer to late summer.
5. A question was raised on what the next 90 days with the new Administration might look like? Eric responded with three issues that the EPA "beachhead team" asked several questions about (noting that the full complement of political appointees being in place is still a ways out):
    a. The LTR-LCR and Flint
    b. Infrastructure funding
    c. PFOA and PFOS – EPA Administrator Pruitt was asked several questions about these during his confirmation hearings.
6. A question was raised about the 24-hour consumer notice in WIIN based on an exceedance and the expectation for privacy? Eric responded that the legislation also requires notification when EPA receives elevated lead data from outside parties and requires EPA to develop a strategic plan in 180 days to address this issue after ~~and to~~ consulting with states and water systems. Another question was raised on whether this

WIIN provision applied to all contaminants or just lead *(note that a copy of the relevant section of WIIN is enclosed and this notification provision only applies to exceedances of the lead action level).*

7. Eric summarized his take-aways from EPA Administrator Pruitt's talk to Agency staff the morning of the 22nd and Pruitt emphasized three areas:
    a. How are regulations are important to make things predictable
    b. The importance of the rule of law
    c. Federalism matters
8. After Eric's departure from the conference call, the Board discussed a few logistical items for the March Board Meeting.

Message

From: Burneson, Eric [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=2CACB9A8D49F49AF80531E9E2CCB9018-EBURNESO]
Sent: 8/15/2018 6:58:13 PM
To: Roberson, Alan [aroberson@asdwa.org]; Christ, Lisa [Christ.Lisa@epa.gov]; Helm, Erik [Helm.Erik@epa.gov]; Kempic, Jeffrey [Kempic.Jeffrey@epa.gov]
CC: dosterhoudt@asdwa.org; Wendi Wilkes [wwilkes@asdwa.org]
Subject: RE: Food for thought for ASDWA Board Conference Call on Thursday
Attachments: questions for ASDWA meeting 8-15-18.v2.docx

Alan:
Thanks for the food for thought. Attached for your consideration are the questions we would like to discuss in the meeting with the ASDWA. Thanks again for arranging the opportunity to have more discussions with the Board tomorrow.

Eric Burneson, P.E.
Director of Standards and Risk Management
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency
202 564 5250

From: Roberson, Alan [mailto:aroberson@asdwa.org]
Sent: Tuesday, August 14, 2018 7:15 PM
To: Burneson, Eric <Burneson.Eric@epa.gov>; Christ, Lisa <Christ.Lisa@epa.gov>; Helm, Erik <Helm.Erik@epa.gov>; Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: dosterhoudt@asdwa.org; Wendi Wilkes <wwilkes@asdwa.org>
Subject: Re: Food for thought for ASDWA Board Conference Call on Thursday

Eric and Lisa and Erik and Jeff, use this version instead of the version I sent earlier today as Lisa Daniels made some revisions that I think provide some more clarity and we will talk some more on Thursday. Alan

On Tue, Aug 14, 2018 at 2:01 PM, Roberson, Alan <aroberson@asdwa.org> wrote:

> Eric and Lisa and Erik and Jeff, you likely have some LTLCR issues that you would like to talk to the ASDWA Board about, but I have also enclosed some food for thought for our discussions on Thursday.
>
> Alan
>
> **********************************
> **J. Alan Roberson, P.E.**
> *Executive Director*
>
> **Association of State Drinking Water Administrators (ASDWA)**
> 1401 Wilson Blvd. - Suite 1225
> Arlington, VA 22209
>
> Office: (703) 812-9507

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****

J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

Questions for ASDWA regarding the "**Strengthened Regulatory Framework Using "Bins"** from their March 2018 Federalism Input (attached)

1. Is there technical basis (health or technology based) for the selection of the potential action levels associated with bins #2 (5 ppb) # 3 (10 ppb)?
2. The framework describes triggering requirements for preparatory actions like developing CCT plans developing LSLR plans and conducting WQP assessments at lower 90th percentile values than currently trigger actions for small system. Is it the states experience that for most of these systems 90th percentile lead levels will increase gradually over time? What about the systems that have 90th percentile values that are relatively consistent? For example, does ASDWA believe that systems should take preparatory actions even if they have a history of 90th percentiles consistently between 5 and 10?
3. We have observed from historical LCR 90th percentile data that systems may also have significant variations between monitoring periods such that their 90th percentile levels may go up or down by more than an increment of 5 ppb which under the Framework could result in systems being placed into a higher or lower bin every six months or year. How do the states envision managing the transitions of systems between bins? Given that actions required in the bins may take more than 6 months or a year to complete, what would states envision happens to requirements like CCT plans that may not be completed when a system's 90th percentile drops enough so that it is no longer a Bin 2 system?
4. Could you describe the components of the LSLR plan to be developed in bin 2? How long would systems have to develop the plan, will there be required removal targets, and will all size system in bin 2 be required to develop a plan?
5. Describe how the LSLR pilot would work and what is the goal of the pilot? How long would systems have to implement the pilot?
6. What does the voluntary LSLR program entail in bin 3?
7. In bin 4 after an ALE is a mandatory LSLR program envisioned? What replacement rate should be required?
8. If a system's WQ improves how long should a system that was in bin 4 still conduct their required LSLR program? The same question applies to the voluntary program in bin 3 and may apply to the study and pilot in bin 2.
9. Given the limitations of the smallest water systems, what are states thoughts with respect to point of use treatment as alternatives to corrosion control treatment and or lead service line replacement?

Excerpt from ASDWA's March 8, 2018 Federalism Input on Long Term Revisions to the Lead and Copper Rule

Strengthened Regulatory Framework Using "Bins" Targets Additional Requirements
The LCR Federalism Consultation approach posed some challenges for ASDWA's members (as co-regulators with EPA) in developing substantive comments. As previously mentioned, the current LCR is probably the most complex drinking water regulation with lots of moving parts, and many potential regulatory changes have been discussed and debated for the past 15-20 years.

EPA presented questions on five topics at the initial [HYPERLINK "https://www.epa.gov/sites/production/files/2018-01/documents/eo_13132_federalism_consultation_presentation-final_1.9.2018.pdf"] [HYPERLINK "https://www.epa.gov/sites/production/files/2018-01/documents/eo_13132_federalism_consultation_presentation-final_1.9.2018.pdf"]. The challenge ASDWA faced was how to connect the topics together in a holistic regulatory framework that shows how each builds and integrates with the other. ASDWA's Board of Directors met this challenge by developing a progressively more stringent regulatory framework based on increasing levels of the 90th percentile of lead samples for 1-liter first draw tap samples. The framework fits the pieces of the regulatory "jigsaw puzzle" together into a holistic approach and targets more stringent regulatory treatment technique requirements where they are needed most. The "bins" regulatory framework is detailed below.

Bin	Lead 90th percentile	Corrosion Control Treatment (CCT)	Lead Service Lines (LSLs)	Water Quality Parameters (WQPs)	PE and Outreach Materials	Tap Sampling
#1	0-5.0 µg/L	Retain current requirements for triggering installation of CCT	Retain current requirements for triggering LSL replacement (LSLR)	Retain current requirements for WQP monitoring for systems with CCT	Provide public education (PE) in Consumer Confidence Report (CCR) & other delivery channels	Retain frequency & triggers in current rule. Allow triennial monitoring
#2	5.0-10.0	Retain current requirements for triggering installation of CCT	Develop LSLR plan & pilot LSLR plan	WQP assessment to evaluate changes in water chemistry	Deliver targeted PE for homes with LSLs	Annual monitoring with standard number of sites. No triennial monitoring
#3	10.0-15.0	Require CCT study that identifies appropriate CCT if Action Level (AL) is exceeded – Implement distribution system find & fix protocol	Implement proactive voluntary LSLR	Increase frequency and number of sampling sites for WQP monitoring. Recommend optimal WQP ranges as part of CCT study	Deliver targeted PE to areas of distribution system based on find and fix	Monitor every six months
#4	>15.0 µg/L	Require CCT	Require implementation of LSLR plan	Require WQP monitoring based on CCT	Deliver broader PE and outreach materials for all	Monitor every six months

Each bin builds upon the previous bin. For example, a system in bin #2 must comply with the regulatory requirements in both bins #1 and #2. A system in bin #3 must comply with the regulatory requirements in bins #1, #2, and #3. A system in bin #4 must comply with all the requirements in all bins.

This framework eliminates several "loopholes" in the current rent. For example, water systems would not be able to sample repeatedly at sites with low lead levels to reduce their 90th percentile. Systems would not be able to sample from sub-optimal sites based on outdated information, i.e.,
for systems with a blend of LSL and non-LSL homes, all compliance sampling locations would need to be at LSL homes.

This framework also has some details that warrant further discussions and deliberations. For example, some of the above components will need an "anti-backsliding" approach, such as corrosion control treatment (CCT). Once CCT is initiated, it should be considered a permanent installation and not suspended when 90th percentiles decline. Further discussion between EPA and ASDWA (as co-regulators) is also needed on how much existing data (grandfathering) could be used for initial bin placement.

This regulatory framework parallels other NPDWRs, such as the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and prioritizes regulatory actions for systems that have higher 90th percentiles, thereby increasing public health protection in a timely manner. It also recognizes and allows water systems in the lowest bin (bin #1 with a 90th percentile of 0-5.0
μg/L) to maintain their present actions. Water systems in the lowest bin would not be required to make the investment to replace lead service lines (LSLs) when the inherent water chemistry or corrosion control is working and a sufficient scale inside the pipe has been formed to minimize lead exposure. The framework is proactive in that if a system is in bin #3 (10.0-15.0 μg/L), steps will be required that would hopefully prevent the systems from exceeding the 15 μg/L Action Level (AL). Finally, this framework encourages systems to strive for a lower bin with less regulatory requirements that would ultimately lead to increased public health protection.

The assessment in bin #2 should include an evaluation of more frequent lead and water quality parameter (WQP) monitoring, the WQP operational range, more representative locations, the potential need for additional WQP parameters such as dissolved inorganic carbon (DIC), etc. ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed assessment.

The broader public education and outreach effort in bin #4 should include increased frequency, targeted delivery, good faith effort to reach renters, and partnerships with schools and day care centers and local health agencies. Again, ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed outreach effort. The [HYPERLINK "https://www.lslr-collaborative.org/"] [HYPERLINK "https://www.lslr-collaborative.org/"] of which ASDWA is a member, would provide a forum for development and distribution of the broader public education and outreach materials.

Additionally, EPA needs to take the lead with all federal agencies in reducing total lead exposure and the distribution of such materials to others that need them besides states and water systems, such as the Department of Education for schools and the Department of Health and Human Services (HHS) for childcare facilities and local health agencies.

Message

From: Banks, Victoria [Banks.Victoria@epa.gov]
Sent: 4/30/2015 3:56:53 PM
To: Ellis, Jerry [Ellis.Jerry@epa.gov]; Kempic, Jeffrey [Kempic.Jeffrey@epa.gov]; Damico, Brian [Damico.Brian@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]; Lytle, Darren [Lytle.Darren@epa.gov]; Adams, Minnie [Adams.Minnie@epa.gov]; Andrew, Sallach [Sallach.Andrew@epa.gov]; Banks, Karl [Banks.Karl@EPA.GOV]; Banks, Victoria [Banks.Victoria@epa.gov]; Bell, Kristina [bell.kristina@epa.gov]; Calow, Stan [Calow.Stan@epa.gov]; Clark, Johnny [Clark.Johnny@epa.gov]; Clement, Robert [Clement.Robert@epa.gov]; Darman, Leslie [Darman.Leslie@epa.gov]; Darren Osterhoudt [dosterhoudt@asdwa.org]; Deason, Ken [Deason.Ken@epa.gov]; Deltoral, Miguel [deltoral.miguel@epa.gov]; Donahue, Linda [Donahue.Linda@epa.gov]; Gambatese, Jason [Gambatese.Jason@epa.gov]; Griese, Andrea [Griese.Andrea@epa.gov]; Hankinson, Julie [hankinson.julie@epa.gov]; Jacobsen, Lisa [Jacobsen.Lisa@epa.gov]; Jim Taft [jtaft@asdwa.org]; King, Carol [King.Carol@epa.gov]; Kwong, Ellie [kwong.ellie@epa.gov]; Lad, Paul [Lad.Paul@epa.gov]; Lee, Bessie [Lee.Bessie@epa.gov]; Marshall, Wendy [marshall.wendy@epa.gov]; McKenna, Gerard [McKenna.Gerard@epa.gov]; McKinley, Helen [McKinley.Helen@epa.gov]; Mohr, Mindy [Mohr.Mindy@epa.gov]; Moriarty, Edward [Moriarty.EdwardJ@epa.gov]; Ngo, Kim [Ngo.Kim@epa.gov]; Noureldin, Mostafa [noureldin.mostafa@epa.gov]; Palagian, Evangelia [Palagian.Evangelia@epa.gov]; Poon, Robert [poon.robert@epa.gov]; Porter, Andrea [porter.andrea@epa.gov]; Rasso, Mark [Rasso.Mark@epa.gov]; Rizzo, George [Rizzo.George@epa.gov]; Sceery, Mark [Sceery.Mark@epa.gov]; Schock, Michael [Schock.Michael@epa.gov]; Shoven, Heather [shoven.heather@epa.gov]; Smith, Brian [Smith.Brian@epa.gov]; St-Denis, Francine [St-Denis.Francine@epa.gov]; svia@awwa.org; Yates, Roger (Separated) [Yates.Roger@epa.gov]; Yen, Anna [Yen.Anna@epa.gov]; OW-OGWDW Protection Program [OWOGWDW_Protection_Program@epa.gov]
Subject: Reminder LCR 101 webinar coming up!

This is a reminder! If you have not registered for the Lead and Copper Rule 101 Part 1 webinar, here is the link: http://login.icohere.com/registration/register.cfm?reg=1736&evt=LCRPart1
-No registration code is required.

Please send to workgroups, states, or anyone who might be interested!

Thanks!

You are invited to "Requirements Before an Action Level Exceedance," the first webinar in the 3-part webinar series: Lead and Copper Rule (LCR) 101! This webinar will discuss the health effects and sources of lead and copper, give an overview of the LCR, and go through monitoring requirements; including a 90th percentile calculation review. U.S. EPA's Lead and Copper Rule writers and implementation managers will be available to answer audience questions.

Requirements Before an Action Level Exceedance

The First Webinar in the 3-Part Series: Lead and Copper Rule 101

Thursday, May 7th 2015, 1:30pm- 3:30pm EST

Please Spread the Word!

If you have questions about the LCR 101 webinar series or would like more information, please contact:

Victoria Banks: Banks.Victoria@epa.gov

Message

From: Gilbreath, Jan [Gilbreath.Jan@epa.gov]
Sent: 8/19/2016 8:10:43 PM
To: dosterhoudt@asdwa.org
CC: Christ, Lisa [Christ.Lisa@epa.gov]
Subject: An agenda for the Aug. 29 conference call with states
Attachments: Agenda Aug 29 meeting with states on CCT and sampling_lc.docx

Darrell,

Please call me if you have any questions or concerns about the agenda I'm transmitting to you.

Have a good weekend.

Jan

Jan Gilbreath, PhD
U.S. Environmental Protection Agency
Washington, D.C.
202-564-6279

State Input on Long Term Revisions to the Lead and Copper Rule
Corrosion control treatment and tap sampling provisions
August 27, 2016, 2-3 pm EDT
Room 2123; Ex. 6 Personal Privacy (PP) **access code** Ex. 6 Personal Privacy (PP)
Agenda

3:00-3:10 Welcome and Introductions

3:10-3:50 Potential Discussion Questions for States

1. What are the primary barriers to fully optimizing corrosion control treatment for large systems?
2. To what extent are medium and small systems able to designate and implement corrosion control treatment? And to periodically re-optimize CCT?
3. What are the strengths and weaknesses of current tap sampling requirements?
4. What are the strengths and weaknesses of the current lead sampling protocol?
5. Under what circumstances should EPA consider a voluntary tap sampling protocol?
6. What should be the role of water quality parameter monitoring in a revised LCR?
7. What are the impediments to small and medium-sized systems collecting and maintaining WQPs?

3:50-4:00 Wrap Up and Next Steps

NDWAC recommendations:
The National Primary Drinking Water Advisory Council's (NDWAC) LCR working group made a series of recommendations for both corrosion control and tap water sampling.

Corrosion control
The NDWAC recommended the following changes to requirements for corrosion control treatment (CCT):

1. EPA should release a revised CCT guidance manual as soon as possible and update the manual every six years. And large systems should review their existing CCT plans when EPA issues updated CCT guidance. Small and medium systems work with the state to determine if they need to evaluate CCT based on new guidance.

2. The LCR should continue to require re-evaluation of CCT when a public water system makes a change in treatment or source water.

3. Public water systems must maintain records documenting that they reviewed the new EPA guidance manuals and assessed whether and, if so, what changes to CCT are applicable, based on current science.

4. Violations of the CCT provisions would occur for:

a. Failure to notify and consult with primacy agency on re-evaluating CCT if the public water system makes a change in treatment or source water.
b. For large systems, failure to review CCT when EPA updates the guidance manual.
c. For medium or small systems, failure to act if a state notifies a utility that it should assess CCT or make adjustments, based on state review of guidance manuals.

5. Two types of on-going monitoring were recommended:
   a. More robust water quality parameter monitoring to improve process controls for CCT, and
   b. Voluntary customer-initiated tap water sampling coupled with more robust and targeted public education to encourage sampling, in part to provide direct information to consumers that they can use to reduce potential exposures to lead from drinking water in their homes and to provide ongoing information to the public water systems to identify and correct unanticipated problems.

6. Systems that are not currently practicing CCT under the LCR but have been under the lead action level by virtue of either naturally non-aggressive source water or by virtue of other aspects of treatment in use, be required to conduct a water quality parameter monitoring program to demonstrate that the characteristics that caused them to be non-corrosive are still in place.

Tap sampling

The NDWAC recommended the following changes to requirements for tap sampling:

1. A voluntary customer-initiated tap sampling program based on more robust public education efforts should be substituted for the current LCT tap sampling requirements. The voluntary program would be used to a) inform and empower individual households to take action to reduce risk; b) report to heal officials when monitoring results exceed a household action level; and c) provide ongoing information to the utility to assess the effectiveness of CCT.

2. Data from customer-initiated samples that exceeded the household action level would be required to be forwarded to health officials. Data would also be available for public review, and the public water system and the state would review the data and trend analysis during sanitary surveys.

3. If the three most recent years of customer sampling data showed that the 90th percentile was above the system action level, then the public water system must analyze any change or trends in the data to evaluate whether the exceedances were based on system-wide, local, or household-based conditions. The public water system would provide a report to the state for its review and to determine if additional analysis, re-evaluation of CCT, or other actions were appropriate.

4. If the system made any source or treatment changes, the public water system and state should use the customer sampling data in the consultation, review, and approval by the state as required by the LCR.

Cover letter available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2016-01/documents/ndwacrecommtoadmin121515.pdf"]
Full report available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2016-01/documents/ndwaclcrwgfinalreportaug2015.pdf"]

Other stakeholder input

<u>NDWAC Lead and Copper working group member, Dr. Yanna Lambrinidou</u>

Corrosion control
In her dissenting report, Dr. Lambrinidou said that many different schemes exist that can strengthen the LCR's CCT requirement. She said that any effective scheme must include:

1. Robust lead-in-water monitoring,
2. Lead-release minimization in large public water systems,
3. Mandated implementation of appropriate corrective actions following a system action level exceedance, and
4. A regulatory compliance mechanism that links CCT to lead levels at the tap.

Tap sampling
Dr. Lambrinidou believed that the NDWAC working group's recommendation for tap sampling requirements suggested a regime that makes reliable evaluation of CCT practically impossible because it is built on volunteer, customer-initiated tap sampling. That scheme would not take into account all types of homes regardless of their risk in relation to lead in water, she said.

She proposed the following:

1. Ensuring that public water systems target highest-risk homes and provide evidence that these homes meet the rule's highest-risk criteria.
2. Mandating separate sampling protocols for public water systems with no LSLs and those with LSLs, and explicitly banning modifications to the protocols, such as pre-flushing, that would lower lead levels.
3. Mandating annual tap monitoring, unless and until a public water system establishes a documented history of 90th percentile lead levels below the system action level for small and medium systems, and at the lowest concentration feasible for large public water systems.

Full report available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2015-11/documents/ndwaclcrstatementofdissent.pdf"]

Message

From: June Swallow [June.Swallow@health.ri.gov]
Sent: 11/10/2014 6:12:32 PM
To: gbingham@resolv.org
CC: dosterhoudt@asdwa.org; Derrick (DOH) Dennis [Derrick.Dennis@DOH.WA.GOV]; Christ, Lisa [Christ.Lisa@epa.gov]; Robinson, Matt M. [Robinson.MattM@epa.gov]
Subject: state proposal for lead sample invalidation
Attachments: State Recommendation for the NDWAC Committee on Sample .docx

The proposal from the states for invalidation of lead samples is attached.

State Recommendation for the NDWAC Committee on LCR Long Term Revisions Concerning Sample Invalidation

Under the existing regulation (141.86 (f)(1)), "The State may invalidate a lead or copper tap water sample at least if one of the following conditions is met.
(i) The laboratory establishes that improper sample analysis caused erroneous results.
(ii) The State determines that the sample was taken from a site that did not meet the site selection criteria of this section.
(iii) The sample container was damaged in transit.
(iv) There is substantial reason to believe that the sample was subject to tampering."

These are all good and necessary reasons for invalidating a sample and should be retained, but because this list is limited, samples must be accepted that are obvious "outliers" and don't represent the water that is normally consumed and should not be used as a basis for treatment changes or public education. This is especially true for small systems where the limited number of samples required means that a single, unusually high, value can cause the Action Level to be exceeded. This could lead to installation of expensive treatment when treatment is not needed or adequate corrosion control is already being provided. While probably not as frequent, nonrepresentative samples could also cause water systems to be below the action level when treatment changes really are needed. Good invalidation criteria can help states address both problems.

The purpose of the invalidation is to make sure that decisions are based on the most representative set of samples possible and to do so through a process that provides adequate information to make good invalidation decisions and assures documentation of the reasoning behind the invalidation. This proposal from states will serve those two functions.

Criteria

States believe that the essential criteria for invalidation are already well stated in the [HYPERLINK "http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/upload/Revised-Lead-and-Copper-Rule-Monitoring-and-Reporting-Guidance-for-Public-Water-Systems.pdf"] or the October 2006 memorandum on [HYPERLINK "http://water.epa.gov/lawsregs/guidance/sdwa/upload/wsg_178.pdf"]. The language in these documents is consistent with the sampling requirements in 141.86 (b).

- "Always collect a first-draw sample from a tap where the water has stood in the pipes for at least six hours (e.g., no flushing, showering, etc.). However, make sure it is a tap that is used regularly, and not an abandoned or infrequently used tap."
- "First-draw samples collected at single-family residences must always be drawn from the cold-water kitchen tap or bathroom tap."
- "First-draw samples collected from buildings other than single-family homes must always be drawn from an interior tap from which water is typically taken for consumption."
- "Therefore, public water systems should not recommend that customers remove or clean aerators prior to or during the collection of tap samples for lead."

Failure to comply with these simple guidelines for sample collection should be clear grounds for invalidation, if the state concludes, after review of the information provided by the water system or sample collector, that the sample is not representative. Here is how we could turn these guidelines into specific criteria for invalidation:

A water system may request that a sample be invalidated by the primacy agency, or the primacy agency may determine that invalidation is necessary based on a review of sample data if any of these conditions apply:

1. It is not a one liter first draw sample where water has stood in the pipes for at least 6 hours.
2. The sample was not collected from a tap regularly used for consumption.
3. The tap has been unused for an extended period of time, not typical of normal use in that building. (States are recommending anything over 48 hours be used to define "extended period of time" for this criteria)
4. The sample was not collected from a kitchen or bathroom tap in a single family residence or not from an interior tap in another type of building.
5. The sample was collected with the aerator removed, or the aerator was cleaned prior to collecting the sample.

These 5 criteria are in addition to the existing criteria in the rule. Many of them could be considered clarifications of existing provision 141.86 (f)(1)(ii) but are needed because that criteria is not consistently interpreted nationally.

Note: Some of these new invalidation criteria, particularly the extended stagnation time, could be added directly to 141.86(b) as sample collection criteria and might not be needed on the expanded invalidation list.

Process

Once a sample is invalidated, a replacement sample must be collected from the same location or another location with similar characteristics, located as close as possible to the original location, and in a timely manner as required by the current rule in 141.86(f)(4). The results from this new sample will be used in the 90th percentile calculation as a replacement sample and will be used regardless of the results. Failure to collect the required number of samples during the monitoring period may result in enforcement.

Adequate documentation will need to be kept supporting the invalidation decision, as required by the current rule. Many states have already developed a checklist for the homeowner/sample collector to document the conditions surrounding the sample collection. This provides good information for the state to review in order to make a decision on invalidation.

*The provision in 141.86(h)(4) about collecting the replacement at the same site would need to be modified in the case of invalidation where the sample site itself is the problem.

Message

From: Gail Bingham [gbingham@resolv.org]
Sent: 3/18/2016 2:35:11 PM
To: 'Guterman, Damon (DEP)' [damon.guterman@state.ma.us]; 'Derrick Dennis' [Derrick.Dennis@DOH.WA.GOV]; 'Lih-In Rezania (lih-in.rezania@state.mn.us)' [lih-in.rezania@state.mn.us]
CC: Christ, Lisa [Christ.Lisa@epa.gov]; Helm, Erik [Helm.Erik@epa.gov]; 'Jim Taft' [jtaft@asdwa.org]; 'Darrell Osterhoudt (dosterhoudt@asdwa.org)' [dosterhoudt@asdwa.org]
Subject: RE: EPA LCR Work Group planning
Attachments: removed.txt; draft LCR LTR structure_3_17_16.docx

I'm sorry. Here's the attachment. Please note that it is an internal, deliberative document.

Those times sounds fine. My schedule is open both days, but let's wait to hear from the others.

Gail
Ph: (202) 965-6200 | Ex. 6 Personal Privacy (PP)

From: Guterman, Damon (DEP) [mailto:damon.guterman@state.ma.us]
Sent: Friday, March 18, 2016 10:33 AM
To: Gail Bingham; Derrick Dennis; Lih-In Rezania (lih-in.rezania@state.mn.us)
Cc: Lisa Christ; Erik Helm; Jim Taft; Darrell Osterhoudt (dosterhoudt@asdwa.org)
Subject: RE: EPA LCR Work Group planning

Gail,

I am free both Monday and Tuesday next week. As it turns out both afternoons (M: 1:00 to 5:00 Eastern, T: 1:00 to 4:00 Eastern) would be best for me as I have meetings both mornings. I didn't get an attachment in your email.

Thanks,
Damon Guterman
Massachusetts Department of Environmental Protection
Drinking Water Program
1 Winter Street, 5th Floor
Boston, MA 02108
(617)574-6811
Damon.Guterman@state.ma.us

Follow MassDEP on Twitter: http://twitter.com/MassDEP
Visit our web site: http://www.mass.gov/eea/agencies/massdep

From: Gail Bingham [mailto:gbingham@resolv.org]
Sent: Friday, March 18, 2016 10:27 AM
To: Derrick Dennis; Lih-In Rezania (lih-in.rezania@state.mn.us); Guterman, Damon (DEP)
Cc: Lisa Christ; Erik Helm; Jim Taft; Darrell Osterhoudt (dosterhoudt@asdwa.org)
Subject: EPA LCR Work Group planning

Hi Derrick, Lih-In, and Damon,

I am providing facilitation assistance to EPA in organizing the internal work group on long-term revisions to the Lead and Copper Rule, and understand that you will be the state representatives. OGWDW has asked me to discuss the approach, topics and timeline with as many members as possible prior to the first call, and to ask if you have any questions. The plan is to meet by conference call (with those in DC meeting in person) on the first and third Thursday of every month (exact times TBD but in the afternoon eastern for those on the west coast).

Would you have time for a call with me either Monday or Tuesday next week? I am happy to talk with you separately or together depending on your preference and schedules. (If we do a conference call, can I ask if ASDWA would provide a line?)

Attached is a draft outline of the topics OGWDW would like input on, with the presumptions underlying them and specific questions for the work group, which I would like to go over with you and get your thoughts on. I also will go over some initial thoughts about process and ask for your suggestions. We're going to be on a tight timeline, anticipating two calls a month from April through September, so your thoughts about how to make this as focused and effect a process as possible will be welcome.

I'm looking forward to talking with you all about this. Gail

Gail Bingham

Ph: (202) 965-6200 | Ex. 6 Personal Privacy (PP)

Overarching

- NDWAC recommendations will serve as the basic structure of the new rule.
- Additions to the NDWAC recommendations will be made to close loopholes and strengthen required actions.
- Additional requirements may be added if the Agency releases other memos/communications that affect the LCR rulemaking.

Tap Sampling

Applicability

All CWSs and NTNCWSs

NDWAC Recommendations

- Establish criteria for PWSs to transition from current rule framework to new rule framework (i.e. 3 rounds of monitoring under current rule before transition)
- Lead tap sampling will be initiated by customer request
- Customers offered a choice of sampling protocol: first draw, random day time sampling, lead service line
- Determine a minimum number of lead tap samples as a backstop to the voluntary sampling program
- PWSs maintain data sets for analysis and review taking into account the type and location of sample to identify trends and changes.
- PWSs prepare an annual data summary for the state with the most recent three years of data. If the system action level (running three-year calculation) is exceeded the PWS must analyze trends and use the information to "find and fix" the problem (e.g., system-wide, local or house-based conditions)

Recommendations to address other stakeholder concerns

- Ban pre-flushing, establish max stagnation time, ban aerator removal, and add requirements on tap flow rate or size of bottle mouths (consistent with EPA guidance memos)
- Designate a mandatory minimum number of samples to be taken from high risk sites (i.e., tier 1) to be used to calculate System Action Level

Issues for workgroup discussion

- What should be the minimum number of samples for customer requested lead tap sampling?
- What should be the minimum number of high risk (tier 1/lead service line samples) sites needed to calculate the System Action Level?
- How should lead service line tap sample collection be conducted (i.e., what protocol)?

Household Action Level (HAL)

Applicability

All CWS and NTNCWSs

NDWAC Recommendations

- Establish a household action level threshold above which the customer, the state, and local health officials are notified within 30 days that levels of lead in the customer's tap water are of potential concern and should be more closely investigated
    - Customer will also receive detailed lead information and mitigation information

Note: OGWDW will work with other offices (OLEM, OAR, OCSPP, ORD, OP) to clearly define why differences in BLLs or incremental BLL changes have been applied in different regulatory contexts; different IEUBK modeling approaches are necessary; and the use of different exposer pathway and population demographic data are needed for different regulatory applications.

Corrosion Control Treatment

Applicability

All CWS and NTNCWS

- CCT required by all systems serving a population over 50,000.
- Clarify expectations for small- and medium-sized systems not requiring CCT under current rule

NDWAC Recommendations

- Increased parameters, locations and frequency of WQP monitoring to ensure CCT achieves treatment objectives.
- WQP monitoring will take place at entry points to the distribution system and at representative sites throughout the distribution system
- Large systems review CCT with primacy agency after release of updated EPA CCT guidance manual (every six years).
- Small and medium sized systems work with primacy agency to determine frequency of CCT review.
- Systems reevaluate CCT and obtain state approval preceding a change in source water or treatment.
- PWSs prepare an annual data summary for the state with the most recent three years of data. If the system action level (running three-year calculation) is exceeded the PWS must analyze trends and use the information to "find and fix" the problem including re-evaluation of CCT

Recommendations to address other stakeholder concerns

- System Action Level calculated from voluntary customer initiated tap samples at high risk (tier 1) sites and results evaluated to inform CCT

Issues for workgroup discussion

- What should CCT requirements be (WQPs, installation of CCT and evaluation of CCT effectiveness) for small- and medium-sized systems not requiring CCT under current rule?
- What are the appropriate parameters, locations and frequency of WQP monitoring?

Lead Service Line Replacement Program

Applicability

All CWS and NTNCWS

NDWAC Recommendations

- Establishment of a pro-active mandatory Lead Service Line Replacement Program unless system meets requirements for a waiver.
- Systems must conduct an inventory of lead service lines in its distribution system.
- Systems must assume a service line is made of lead unless proven otherwise.
- Systems that demonstrate they do not have any lead service lines can receive a waiver from this requirement.
- PWS must provide targeted outreach to customers who live at sites that have lead service lines, with an invitation to: have their water tested and participate in the LSLR program; and information on the source of lead, health effects of lead and actions to reduce exposure.
- Systems are to replace the target number of LSLs identified in their distribution systems on a 36-month cycle until all lead service lines are removed from its distribution.
- Establish a schedule for LSLR in systems where the distribution system is entirely owned by the utility.
- No change to the definition of control.

Recommendations to address other stakeholder concerns

- Consider setting an enforceable LSLR replacement goal.
- Develop a system of LSLR credits that incentivize water systems to pay for customer-side full LSLR in low income/EJ households and locations with at-risk populations (childcare and schools).

Issues for workgroup discussion

- For outreach activities, what is the appropriate minimum number and frequency of LSLR program activities required on an on-going basis?

- What should be the increase in the number, type and difficulty of activities when LSL replacement goals are not met?
- Is follow-up testing after service line replacement needed, and if so when and how?
- What criteria should a PWS meet to demonstrate a waiver from the LSLR program?
- What are appropriate risk mitigation strategies for consumers (flushing guidance, filters, etc)?

Public Education

Applicability

All CWS and NTNCWS (CCR only applies to CWSs)

NDWAC Recommendations

- Public education (PE) programs will be ongoing; no longer triggered by exceeding the lead action level.
- Require systems to notify customers that they may participate in a voluntary, free lead sampling program.
- Water systems must provide notification to households regarding LSLR program (see LSL replacement section).
- Water systems must also provide periodic notifications to households regardless of LSL presence to educate customers about the risks of lead in drinking water due to possible presence in other premise plumbing materials.
- Public education will be crafted to explain different purposes and interpretations of tap sample results based on choice of sampling protocol: first draw, random grab, lead service line
- Revise the current CCR language to address lead service lines and update the health statements. Require targeted outreach within the CCR, or in addition to, for customers with lead service lines.
- Expand the current requirements for outreach to caregivers/health care and providers of vulnerable populations.
- Provide incentives for establishing relationships with providers, which provide customer-side LSLR grants and customer PE.
- Require PWS provide public access for LSL inventory including locations if possible, legal basis of LSL ownership, the number of lead tap samples collected, the number of samples that exceed the AL, descriptive statistics for voluntary sample results, and changes to CCT, WQP ranges and results.
- Establish a National Lead in Drinking Water Clearinghouse of information about lead in drinking water to serve the needs of the public and of public water systems. Information should include, but not be limited to guidance and templates, particularly to support small systems, and guidelines for best practices in developing PE materials.
- Include additional PE resources from other Agencies (CDC, HUD, State-health providers) on the National Lead in Drinking Water Clearinghouse.

Issues for workgroup discussion

- What should be the frequency and distribution mechanisms for all PE materials?
- What should be the frequency of repeat offers to customers with LSL?
- What data and other information must water systems make available to the public (web site) and the frequency it must be updated?

Copper

Applicability

All CWSs and NTNCWS

NDWAC Recommendations

- All systems are assumed to have water that is aggressive to copper unless demonstrated otherwise.
- EPA will established criteria to define water that is not aggressive to copper and ranges for orthophosphate if used
- Systems have flexibility in how to demonstrate their water is not aggressive to copper: WQP sampling in the distribution system; one time evaluation of copper tap sampling at vulnerable homes (i.e., less than two years); conduct a pipe loop study; or change water chemistry to within range established as "non-corrosive to copper"
- Systems classified as not aggressive must demonstrate by: maintaining WPQ or copper tap sampling at vulnerable homes (i.e., less than two years)
- Systems classified as aggressive must maintain a PE program that must provide either: information to all new homes upon initiation of service and information to newly renovated homes at time of renovations OR information to all customers on a routine basis.
- Considering requirements for CCT if water is classified as aggressive.

Issues for workgroup discussion

- What is the appropriate criteria for water that is defined as "not aggressive" to copper?
- What conditions (if any) would require CCT for copper and what defines OCCT in these cases?

------------ *(08/20/2014 12:46)* ------------

Matt Robinson: Welcome, everyone! We'll get started at 1 PM.

------------ *(08/20/2014 12:57)* ------------

Matt Robinson: We're on mute until we start the call, but if you have trouble with the webinar or phone, you can call Chris Fultz: 202.564.8907. Thanks!

------------ *(08/20/2014 13:18)* ------------

Matt Robinson: Please remember to put your phone on mute.

------------ *(08/20/2014 13:27)* ------------

Derrick Dennis: What was the lead levels in the 3rd, 4th, and 5th sequential samples in the study? The presenter indicated there was no change in the first two.

Clay Commons: In the Montreal study, was dissolved v. Particulate lead investigated?

Stephen Estes-Smargiassi: What was the range of lead values for the water samples in the Montreal study?

Stephen Estes-Smargiassi: Are we continuing to see a decline in children's BLL. The form of the data summary made it hard to see the trend.

------------ *(08/20/2014 13:30)* ------------

Derrick Dennis: Maybe one of the lab folks can attest to this but doesn't the method for analyzing lead in drinking water samples call for acid digestion before analysis? Would that be sufficient to break down the particulate lead in the sample so that it was reflected in the final results?

------------ *(08/20/2014 13:32)* ------------

Sterling Carroll: Did the Montreal study look at the differences lead in waters with adjusting ph's and those treated with corrosion inhibitors such as orthophosphates?

------------ *(08/20/2014 13:34)* ------------

Bob Clement: By relative simple changes in the PE language for lead we can get to non-detect levels for non-lead and lead service lines. Is there any research that shows increases in BLL at non-detect levels for the method?

------------ *(08/20/2014 13:40)* ------------

Mike Schock: Heated digestion is required if the sample has turbidity over 1 NTU. Identified problems are that you can have microparticles of Pb that never add up to 1 NTU. There are also some research papers that have looked at the relative efficacy of simple acid preservations (the operational recoverable approach, acidified, no digestion) vs. Different more robust digestion methods. There were several papers published with different aspects of the Montreal study. There is also a hanging question of bioavailability of different types of Pb particles.

------------ *(08/20/2014 13:56)* ------------

Thomas Plant: I believe we use penicillamine for chelating lead. Is Copper something we should be worried about during normal chelation for lead as well?

------------ *(08/20/2014 14:01)* ------------

Hector F. Gonzalez: Any info from EPA on oral chelation supplements such as garlic, vitamin C, carrageen, zinc, niacin, cayenne pepper lecithin.

------------ *(08/20/2014 14:04)* ------------

Hector F. Gonzalez: Very important for any educational materials and strategies be appropriate culturally and linguistically for the population.

------------ *(08/20/2014 14:09)* ------------

Hector F. Gonzalez: Recommend training and using lay outreach workers (promotoras) to get information out to the public especially low income families.

------------ *(08/20/2014 14:13)* ------------

Thomas Plant: The drinking water results should recommend action steps for removal of lead service lines, or flushing of water systems, replacement of faucets that may contain lead or filtration systems.

------------ *(08/20/2014 14:14)* ------------

Clay Commons: When a customer requests that their tap be sampled, is that sampled required to be a 1-L first draw sample, and must it be included in the 90th percentile computation?

------------ *(08/20/2014 14:16)* ------------

Thomas Plant: Yes, a 1 liter at first draw, 2nd draw after use, and 3rd draw.

Bob Steidel: What is the best practice to measure comprehension of public education materials?

------------ *(08/20/2014 14:21)* ------------

Yanna Lambrinidou: Bob, I think that qualitative research is a very important tool for such an investigation. We can "measure" comprehension by speaking directly with consumers and finding out what they understand about lead/copper and what water use practices they engage in.

Hector F. Gonzalez: Any financial support for small, rural and EJ communities for testing and for plumbing.

Thomas Plant: You may need to have focus groups from several age groups to determine reading comprehension of educational materials. Usually the state education materials tries to reduce the reading comprehension below 6 grade level.

------------ *(08/20/2014 14:24)* ------------

Stephen Estes-Smargiassi: As we discuss comprehension and evaluating, keep in mind the time lines set in the LCR for issuing the required PE after a lead exceedance. Can some of this research be done nationally rather than by individual cities? They might then be better prepared if they must do the lead PE.

Stephen Estes-Smargiassi: And as we think about some sort of copper PE, we should have in mind that type of advance work to be sure the cities have the best resources available before they must act.

------------ *(08/20/2014 14:26)* ------------

Nicole Shao - EPA-ORD: Minnesota did a nice survey studying Cu public education distributed after copper action level exceedances in 4 communities and customer response. We could post it to the Google drive.

Stephen Estes-Smargiassi: Also on copper PE - as I reflect on the short presentation and the health effects presentation, I am struck with the differences between lead and copper. Lead affects almost all populations, it seems the effected populations for copper are much more limited. Thus a different type of targeting based on exposure risk and health risk seems appropriate. We're more likely to get appropriate action by the recipients of our PE material if we reach the right population.

------------ *(08/20/2014 14:29)* ------------

Bob Steidel: How should copper PE address the use of copper / zinc dietary supplements?

------------ *(08/20/2014 14:55)* ------------

Derrick Dennis: To add to Stephen's comment I would also add the fact that it seems from the studies that were presented that copper doesn't have a serious health effect until it reaches levels above the current AL of 1.3 mg/L and still only effects a small number of folks. I would also add this for both lead and copper PE requirements and the level that we are requiring systems to notify the public for both of these. It seems the requirements for lead and far more expansive than other chronic contaminants. Arsenic comes to mind for me when I think about other chronic contaminants that require PN. The requirements for arsenic are far, far less than for lead. I just want to ensure we are gauging the level of efforts we are requiring of systems, and hence, primacy agencies to track based on not only risk, but also what the SDWA requires for other contaminants in the same class. We should also look at the size of systems that are currently exceeding Pb and their abilities to meet all of these activities.

Derrick Dennis: We should set systems up to succeed and still get the right information to the folks that need it so they can make decisions about their health.

------------ *(08/20/2014 15:07)* ------------

Hector F. Gonzalez: Local utilities should collaborate and coordinate with public health to disseminate the correct information.

Christina Baker: Since the target audience for Cu is different, there may be an increased need to expand partnerships to include avenues such as building associations, hardware stores, etc.

------------ *(08/20/2014 15:10)* ------------

Mike Schock: In my experience, public health agencies don't understand sampling for corrosion byproducts, so few will realize the impact of high alkalinity and low pH and copper scale aging on copper release. Since copper is allowed regardless of water quality by almost all plumbing codes, people are unaware. Outreach to appropriate code bodies, materials certifiers, builders, remodelers, plumbers, etc., as well as the potential homeowners and residents, are all very important.

------------ *(08/20/2014 15:13)* ------------

Yanna Lambrinidou: In our experience in Washington DC, public health agencies also don't always understand lead in water (how it corrodes, what forms it takes, what health risks it poses, what health harm it does). The public health community, sadly, did a tremendous disservice to our community in delivering consistently erroneous and misleading messaging.

------------ *(08/20/2014 15:15)* ------------

Mike Schock: Another issue with copper is that if used in inappropriate water qualities, the treatment will be expensive and beyond the technical expertise of NTNCWS, schools and the like. Do we want to create PWSS by installing treatment when usage limits and guidance, and sometimes just replacement, would eliminate that complication?

------------ *(08/20/2014 15:23)* ------------

Hector F. Gonzalez: Medical community and public health need to be partners with utilities especially in regards to health effects, we already get the calls on lead exposure.

------------ *(08/20/2014 15:34)* ------------

Yanna Lambrinidou: Agreed, Hector. We just need to make sure that the medical and public health communities are educated on the issue before they offer themselves as reliable spokespeople and protectors of public health.

------------ *(08/20/2014 15:43)* ------------

Thomas Plant: There are still difficulties with lead and copper in the medical and public health.

Hector F. Gonzalez: Agree educational materials must be very specific and simple as to flushing technique, time, using only cold water not hot water, using bottled water for baby formula if levels are high as well what other precautions should the public take as well where they can get more information.

Hector F. Gonzalez: Agree that we need to look at a national standard to discuss drinking water safety

Lynn Thorp: Gary's suggestion on broader PE effort is interesting one. I recognize is broader than this work group but perhaps we could discuss to see if it is a recommendation we could agree on.

------------ *(08/20/2014 15:47)* ------------

Nicole Shao - EPA-ORD: Is it possible to share the Denver Water Lead Plumbing Awareness materials messaging on the Google drive? It would also be helpful if other utilities that have messaging examples. Share them with the group.

Yanna Lambrinidou: I think that Melissa's point about *relationships* is absolutely key. So even if there were ways to develop a nationally coordinated approach to water quality PE (Gary's idea), I think that the "local" (relational) component will always be critical.

Message

From: Christ, Lisa [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=10DBD8E424704E43B5A50F74A4DAC626-LCHRIST]
Sent: 10/23/2013 6:00:11 PM
To: Osterhoudt, Darrell [dosterhoudt@asdwa.org]
Subject: RE: State/EPA Roundtable and Regulatory Committee agendas
Attachments: LCR NDWAC Whitepaper 09 30 13.pdf; epa815s13001.pdf

Hi Darrell,
I wanted to provide the materials for the EPA-State roundtable discussions on stakeholder engagement for LCR and the Reduction of Lead in Drinking Water Act Frequently Asked Questions.
I've attached 1) The white paper EPA developed for a NDWAC working group outlining 5 key issues for which EPA is seeking input and 2) the revised FAQs, which were posted on the Agency web site yesterday at: http://water.epa.gov/drink/info/lead/index.cfm
I realize I've missed your deadline for shipping, but hope these materials will still be useful.
Lisa

From: Osterhoudt, Darrell [mailto:dosterhoudt@asdwa.org]
Sent: Friday, September 27, 2013 2:15 PM
To: Burneson, Eric
Cc: Carroll, Gregory; Christ, Lisa
Subject: Re: State/EPA Roundtable and Regulatory Committee agendas

Thanks. We will need any handout materials by October 15 so we can put them with the material we ship to Long Beach.

Darrell Osterhoudt
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On Fri, Sep 27, 2013 at 2:11 PM, Burneson, Eric <Burneson.Eric@epa.gov> wrote:

Darrell: we are comfortable with the agenda and will likely provide copies of the Lead Free FAQs, the LCR white paper for NDWAC and may have materials related to the UCMR to share .

From: Osterhoudt, Darrell [mailto:dosterhoudt@asdwa.org]
Sent: Friday, September 27, 2013 9:33 AM

To: Burneson, Eric; Carroll, Gregory; Christ, Lisa
Subject: Re: State/EPA Roundtable and Regulatory Committee agendas

Here is an updated Roundtable agenda. Also, I realized I had inadvertently left Lisa off the distribution for the original email.

Please advise me of any changes needed. Also we need to know if there are any specific handouts to share. We were already planning on including the Lead Reduction Act FAQs and final UCMR3 reference level information (if available).

Thanks. Have a good weekend.

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On Wed, Sep 25, 2013 at 10:39 AM, Osterhoudt, Darrell <dosterhoudt@asdwa.org> wrote:

Good morning -

I wanted to make sure you were plugged in to our plans for some discussions of SRMD issues during the upcoming ASDWA Annual Conference. You have probably seen some of this before but since you are identified in one or the other (or both), I want to make sure you have seen the latest! These are the topics we think are important to the states. We can tweak the topics and substitute other names on the EPA side whenever that is appropriate.

As you know, both of these meetings are fairly informal and PowerPoint presentations are not needed, just a verbal update on the topic to kick off discussion. If a handout would be helpful to support discussion, we are glad to include something in the meeting materials.

We have not made a final decision yet on whether the Regulatory/Small Systems Committee meeting will be closed (states and EPA only) or open. However, with the topics we have on the agenda, we are inclined to make it an open meeting. If you have issues that you wish to explore here (as opposed to the State/EPA Roundtable), that can only be discussed in a closed session, we will be glad to have it closed.

We'll appreciate your input on either of the agendas.

Thanks for your support of the conference.

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This form is intended for use by child care facilities and small schools that have ten (10) or fewer drinking water outlets when collecting samples for lead testing. Each data element is defined in the **Glossary of Terms**.

Facility Name:	**Number of Children Served:**	**Building Number:**
Street Address:	**City, State, Zip Code:**	*Outlet types: BF=bathroom faucet; CF=classroom faucet; DW=drinking water fountain; KF=Kitchen faucet; NS=nurse's office sink; WC=water cooler (chiller unit)
3Ts Lead Trigger Level (ppb or ppm):	**Sampler's Name:**	

	Sample ID *(ENTER: unique identifier for sample that reflects outlet info: Outlet type*, room #, and sample #)*	Sample Date *(ENTER: MM/DD/YYYY)*	Time Sample Collected *(ENTER: am or pm. E.g., 5:30 am)*	Sample Type *(ENTER: Primary or First-draw, Follow-up Flush, or Sequential)*	If outlet has a filter or aerator, was the sample collected with it still installed? *(ENTER: Yes, No, or Unknown)*	Sample Result (received from lab) *(ENTER: # in ppb, µg/L, ppm, or mg/L. E.g., 5 ppb)*	Notes *(ENTER additional info here. E.g., outlet details)*
TESTING							

Example Sampling Field Form for Child Care Facilities and Small Schools

TAKING ACTION	Sample ID # *(This should be copied from the Testing table above.)*	**Indicate (by Sample ID) the status and type of Action** your facility is taking in response to a sample result. *(Select: Planned, In-progress, Completed, or N/A).*		
		Follow-up *(SELECT an option for each sample)*	**Remediation** *(SELECT an option for each sample)*	**Replacement** *(SELECT an option for each sample)*
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
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		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
		Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐	Planned ☐ Completed ☐ In-progress ☐ N/A ☐
General Notes *(Enter additional information here about Taking Action activities)*				

Example Sampling Field Form for Child Care Facilities and Small Schools

Glossary of Terms (in order of appearance on form)

Facility Name: The name of the child care facility or school that is conducting testing.

Number of Children Served: This is the total count of the number of children enrolled in the child care facility or school at the time of testing.

Building Number: This is the number used to identify the building from where samples will be collected. If there is not a specific number, enter 1.

Street/Mailing Address, City, State, Zip Code: The complete address of the child care facility or school.

3Ts Lead Trigger Level (ppb or ppm): This is the level of lead detected in a sample that you have selected that will trigger follow-up, remediation, or replacement actions. This level should be determined as part of completing your sampling plan under the U.S. Environmental Protection Agency (EPA) 3Ts program or state program. The level may be set by the facility and/or state, depending on existing state regulations and funding support. Your state may have set this level through a state regulation. If your facility is receiving Water Infrastructure Improvements for the Nation Act (WIIN) grant funding through the state, then the state is required to set this level for your facility. For more guidance on this level, ask your state or refer to the 3Ts guidance at https://nepis.epa.gov/Exe/ZyPDF.cgi/P100VLI2.PDF?Dockey=P100VLI2.PDF.

Sampler's Name: The name of the person who collected the samples.

Sample ID: The Sample ID should be a unique name to identify a sample based on the outlet being tested. It should follow this naming sequence: outlet type-room number-sample number, or DW-Rm2-#1. Outlet type codes include BF=bathroom faucet; CF=classroom faucet; DW=drinking water fountain; KF=Kitchen faucet; NS=nurse's office sink; WC=water cooler (chiller unit). This sample ID is used for both the Testing and Taking Action sections of the form.

Sample Date (MM/DD/YYYY): Date sample was collected at each outlet.

Time Sample Collected: This is the time the sample was collected. Indicate AM/PM.

Sample Type: This indicates the type of sample collected: primary or first-draw, follow-up flush, or sequential.

- *Primary or first-draw*: This type of sample is collected after an 8-18 hour stagnation period and at the beginning of the day before water has been used at the facility.
- *Follow-up flush*: This type of sample is collected when the primary or first-draw sample yields a high lead result. The fixture is flushed before collecting a sample to determine if the lead is from the fixture itself or from another source.
- *Sequential*: This type of sampling is more advanced and would occur if a follow-up flush sample also yielded a high lead result. Sequential samples are collected as a series of samples to determine the source of lead.

For more information on sample types, refer to 3Ts Module 4: Developing a Sampling Plan and 3Ts Module 5: Conducting Sampling & Interpreting Results.

If outlet has a filter or aerator, was the sample collected with it still installed?: Build-up can accumulate in filters and aerators and may lead to elevated lead levels, so it is important to note their presence during sampling. If the sample results are high, the first step would be to remove and clean the aerator or change the filter. If this is not known, enter "Unknown."

Sample Result (received from the lab; in ppb, µg/L, ppm, or mg/L): This indicates the amount of lead detected in the sample. If there was no lead detected, write ND for "non-detect." Enter a number with the corresponding units.

Notes: This field can be used to record additional information, such as outlet details.

Example Sampling Field Form for Child Care Facilities and Small Schools

Indicate (by outlet tested) the status and type of Action your facility is taking in response to a sample result: Data should be entered here for all samples collected. For each action type (defined below) indicated whether the status is planned, in-progress, completed or not applicable (N/A). If a lead sample result was above the **3Ts Lead Trigger Level** (which is determined by you or your state), then your facility should be taking action (follow-up, remediation, or replacement). If lead sample result was below the **3Ts Lead Trigger Level**, then it is likely no additional actions will be needed, and you can respond "N/A" for all outlets:

- ***Follow-up activities***: These are short-term measures that may include but are not limited to steps such as follow-up testing; communication; issuing do not drink orders; providing students with water bottles to bring water from home; or temporarily placing fountains out of commission. This does not include activities related to remediation or replacement.
- ***Remediation activities***: These can be short-term or long-term activities, which may include but are not limited to routine maintenance, such as cleaning debris from aerators; initiating protocols for flushing the building's piping system; or turning off contaminated outlets. This does not include fixture or outlet replacement.
- ***Replacement activities***: Replacement here refers to permanent long-term strategies, which include but are not limited to replacing fixtures or internal piping in the facility.

General Notes: This is an open field where you can include any applicable additional notes. For example, this could be used to report additional details of any follow-up, remediation, and/or replacement actions planned or implemented.

Continue to Cover Sheet

Instructions

Sheet Name	Description
Cover Sheet	*This sheet is intended to capture general information about the facility undergoing testing for lead in drinking water. Facilities should enter data directly into this sheet. If a data field is marked with an asterisk(*), then it is a required field and must be filled in for reporting data on the Facility Tally sheet to autopopulate.*
Raw Sample Data	***This is your facility main sheet to organize testing and taking action data** . Facilities should enter information for each sample collected directly into this sheet. If a data field is marked with an asterisk(*), then it is a required field and must be filled in for reporting data on the Facility Tally sheet to autopopulate.*
Facility Tally	*This sheet can be used to report to the state if your facility is participating in a lead testing program funded by a Water Infrastructure Improvements for the Nation Act (WIIN) grant. Information from the Cover Sheet and Raw Sample Data sheet will automatically populate the reporting fields on the Facility Tally sheet. You do not need to enter data into this sheet, but you should check the autopopulated fields to ensure they are correct. This information should be sent to the state and may be used for state-level reporting.*
Data Description	*This sheet includes expanded definitions and clarification on data elements from the Cover Sheet, Raw Sample Data, and Facility Tally sheets. This is a reference sheet and does not require any data input.*
* (asterisk)	*Indicates required fields that are used to autoppulate cells in the "Facility Tally" sheet.*

Key

Fillable Field	*Indicates that data should be entered into a cell.*
Formula	*Indicates that this cell contains a formula which will autopopulate based on other data entered. Data should not be entered directly into this cell.*

Return to Instructions Continue to Raw Sample Data

*** indicates required field**

Data Element	Instructions/Description	Input	
Name of School*	*Enter the full name of the school that is conducting testing.*	xyz school	
Street Address	*Enter the physical street address of the school.*	2 Main St	
City*	*Enter the name of the city in which the school is located.*	abc	
State*	*Select from the pre-populated dropdown list of states/territories to indicate the state in which the school is located.*	Kansas	
Zip Code	*Enter the zip code in which the school is located.*	00000-0055	
Contact (name of person)	*Enter the name of the school's contact for lead in drinking water testing.*	John Smith	
Responsible Department	*Enter the name of the department responsible for carrying out the testing program at the school.*	Maintenance	
Phone Number	*Enter the phone number used to reach school's responsible department (e.g., (XXX) XXX-XXXX ext. XXX). This number should be an office phone number in case the contact person changes.*	(000) 000-0000 ext. 123	
School District (if applicable)*	*Enter the district in which the school is included.*	abc	
Facility State ID	*Enter the state-level identification number assigned to the school.*	123	
PWS ID (if applicable)	*If the school is a public water system (PWS), enter the PWS identification number (PWS ID).*	N/A	
School NCES ID*	*Enter the 12-digit identification number for the school.*	123456789123	
Type of Facility*	*Select from the drop-down menu to indicate whether the facility is considered a private school, public school, charter school, or other as determined by the U.S. Department of Education and respective state regulations.*	Public School	
	If "Other" please describe:		
Grade Level of School Population	*Enter the grade range of the school (e.g., Pre-K through 8).*	Pre-K through 8	
Number of Students at the School*	*Enter the total number of children enrolled in the school at the time of testing.*	250	
Frequency of Sampling	*Select from the drop-down to indicate the anticipated frequency of sampling (i.e., one-time, annual; every 3 years, etc.).*	Select the Sampling Frequency	
	If "Other" please describe:		
3Ts Lead Trigger Level (in ppb or ppm)*	*Enter the level of lead and select the unit of measure (ppb or ppm). This is the level of lead detected in a sample that will trigger follow-up, remediation, or replacement actions. This level should be determined as part of completing your sampling plan under the EPA 3Ts program or state program. The level may be set by the facility and/or state, depending on existing state regulations and funding support. If your facility is receiving Water Infrastructure Improvements for the Nation Act (WIIN) grant funding through the state, then the state is required to set this level for your facility. For more guidance on this level, ask your state or refer to the 3Ts guidance.*	0.010	ppm
	Automatically converts value in cell C23 to ppb.	10	ppb

Continue to Facility Tally Return to Cover Sheet

*** indicates required field**

Building Number (if applicable)	Floor and/or Room Number	Outlet Name
Enter the number of the building where the tested outlet is located.	Enter the floor and/or room number where the tested outlet is located.	Enter the name of the outlet within the room. You can use a naming scheme that is convenient for your facility, but each outlet should have a unique name.
1	2	DW-2-1
1	2	BF-2-1

TES

Outlet Type	Name of the Sampler	Sampling Date (MM/DD/YYYY)*	Sample Time (HH:MM AM/PM)	Number or ID Used on Sample Bottle
Select the type of outlet being tested.	Enter the name of the individual who collected the sample.	Enter the date the sample was collected.	Enter the time the sample was collected.	Enter the identification used on the bottle containing the sample.
Drinking water fountain		3/2/2020	6:30 AM	1
Bathroom faucet		3/31/2020	6:30 AM	1
Select Outlet Type				
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STING

If outlet has a filter or aerator, was sample collected with it installed?	Lead Sample Result # (no units)*	Unit of Measure	Lead Sample Result in ppb (auto-calculated)
Select whether the outlet sampled has a filter or an aerator or if this information is unknown.	Enter the amount of lead in the sample. Enter the exact value (without units) or select "Non-detect" or "Below Reporting Limit" from the drop-down.	Select the unit of measurement of the lead in sample.	Indicates the amount of lead in the sample in parts per billion.
Yes	0.015	ppm OR mg/L	15
Yes	Non-detect	ppb OR µg/L	Non-detect
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Type of Sample	Testing Status	Who was the result of the lead sample communicated to?
Select the type of sample. The different types of sample are defined in the **Data Description** tab.	Select an option below to indicate where your facility is in the 3Ts process.	Select an option below to indicate who your facility has communicated lead results to. Communication can include press releases, letters/fliers, mail/newsletters, website/social media posts, and presentations.
Primary or First-draw	Initial Testing	Staff and parents
Primary or First-draw	Initial Testing	Staff
Select Type of Sample	Select an Option	Select the Audience
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TAKING A

What *follow-up* actions has your facility implemented or planned to implement to reduce lead exposure? *	What is the status of these *follow-up* actions?	What *remediation* actions has your facility implemented or planned to implement to reduce lead exposure? *
Select an option to indicate whether your facility has implemented or is planning to implement follow-up actions. Follow-up actions are defined in the **Data Description** tab.	Select the status of the follow-up actions.	Select an option to indicate whether the facility has implemented or is planning to implement remediation actions. Remediation actions are defined in the **Data Description** tab.
Follow-up Testing	Completed	Flushing
None	N/A	None
Select an Option	Select Status	Select an Option
Select an Option	Select Status	Select an Option
Select an Option	Select Status	Select an Option
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CTION

What is the status of these *remediation* actions?	What *replacement* actions has your facility implemented or planned to implement to reduce lead exposure? *	What is the status of these *replacement* actions?
Select the status of the remediation actions.	Select an option to indicate whether the facility has implemented or is planning to implement replacement actions. Replacement actions are defined in the **Data Description** tab.	Select the status of the replacement actions.
Planned	None	N/A
N/A	None	N/A
Select Status	Select an Option	Select Status
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Notes/Comments
Enter additional details not included in previous columns (e.g., more information about taking action, location notes, description of "other" outlet type, details about filters/aerators, color of the water when sampled, etc.).
NA

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Continue to Data Description

*** Fields in this sheet are autopopulated from the "Cover Sheet" and "Raw Sample Data" sheet**

School NCES ID
Indicates the school's NCES ID.
123456789123

Return to Raw Sample Data

City	State	Name of School	Type of Facility
Indicates the city in which the facility is located.	Indicates the state in which the facility is located.	Indicates the name of the school.	Indicates the type of facility.
abc	Kansas	xyz school	Public School

3Ts Lead Trigger Level (in ppb)	School District (if applicable)	Number of Students at the School
Indicates the level of lead detected in a sample that triggers follow-up, remediation, or replacement actions.	Indicates the school district in which the school is included.	Indicates the number of students that attend the school.
10	abc	250

Sampling Begin Date	Sampling End Date	Number of Samples Collected
Indicates the date the facility began sampling.	Indicates the date the facility ended sampling.	Indicates the total number of samples collected from the facility.
3/2/2020	3/31/2020	2

Number of Samples with Lead Detected	Number of Samples with Lead Detected Above the 3Ts Lead Trigger Level
Indicated the total number of samples with lead detected.	Indicates the number of samples with lead detected that are above the level that triggers additional follow-up, remediation, or replacement actions.
1	1

Number of Outlets Requiring Follow-Up	Number of Outlets Requiring Remediation
Indicates the number of outlets tested that require follow-up actions to reduce exposure to lead.	Indicates the number of outlets tested that require remediation to reduce exposure to lead.
1	1

Number of Outlets Requiring Replacement
Indicates the number of outlets tested that require replacement to reduce exposure to lead.
0

Return to Facility Tally

	Data Elements (in order of appearance)	Description
Cover Sheet	* (asterisk)	Indicates required fields that are used to autopopulate cells in the "Facility Tally" sheet.
	Name of School	The full name of the school that is conducting testing. This is a required field and must be filled in.
	Street Address	The street address of the school. This should be the physical address where the school is located.
	City	The name of the city in which the school is located. This is a required field and must be filled in.
	State	The state or territory in which the school is located. This is a required field and must be filled in.
	Zip Code	The zip code in which the school is located.
	Contact (name of person)	The name of the school's contact for lead in drinking water testing.
	Responsible Department	The name of the department responsible for carrying out the testing program at the school.
	Office Phone Number	The phone number used to reach school's responsible department (e.g., (XXX) XXX-XXXX ext. XXX). This number should be an office phone number in case the contact person changes.
	School District (if applicable)	The school district in which the school is included. This is a required field and must be filled in. If not applicable, enter N/A.
	Facility State ID	The state-level identification number assigned to the schools.
	Facility PWS ID	The Public Water System (PWS) identification number for schools that are classified as PWSs.
	School NCES ID	The 12-digit identification number for the school. This is a required field and must be filled in. If not applicable, enter N/A.
	Type of Facility	Whether the facility is considered a private school, public school, charter school, or other as determined by the U.S. Department of Education and respective state regulations. This is a required field and must be filled in.
	Grade Level of School Population	The grade range of the school.
	Number of Students at the School	The total count of the number of children enrolled in the school at the time of testing. This is a required field and must be filled in.
	Frequency of Sampling	The schedule for sampling. For example, if the facility only intends to test once, then select one-time. If the facility tests for lead in drinking water every 3 years, select every 3 years. You can choose "Other" if the pre-written choices do not fit your schedule and specify the frequency in the space provided.
Raw Sample Data	* (asterisk)	Indicates required fields that are used to autopopulate cells in the "Facility Tally" sheet
	3Ts Lead Trigger Level (in ppb)	This is the level of lead detected in a sample that you have selected that will trigger follow-up, remediation, or replacement actions. This level should be determined as part of completing your sampling plan under the U.S. Environmental Protection Agency (EPA) 3Ts program or state program. The level may be set by the facility and/or state, depending on existing state regulations and funding support. Your state may have set this level through a state regulation. If your facility is receiving Water Infrastructure Improvements for the Nation Act (WIIN) grant funding through the state, then the state is required to set this level for your facility. For more guidance on this level, ask your state or refer to the 3Ts guidance at https://nepis.epa.gov/Exe/ZyPDF.cgi/P100VLI2.PDF?Dockey=P100VLI2.PDF. This is a required field and must be filled in.
	Building Number (if applicable)	The number of the building where the tested outlet is located.
	Floor and/or Room Number	The floor and/or room number where the tested outlet is located.
	Outlet Name	The name of the outlet. You can use a naming scheme that is convenient for your facility, but each outlet should have a unique name.
	Outlet Type	The type of outlet being tested: drinking water fountain, kitchen faucet, water cooler, bathroom faucet, classroom faucet, nurse's sink, and other.
	Name of the Sampler	The name of the individual who collected the sample.
	Sampling Date	The date the sample was collected. This is a required field and must be filled in.
	Sample Time (HH:MM AM/PM)	The time the sample was collected.
	Number or ID Used on Sample Bottle	The identification used on the bottle containing the sample.
	If outlet has a filter or aerator, was sample collected with it installed?	This indicates whether the outlet sampled has either a filter or an aerator, or if this information is unknown.
	Lead Sample Result # (no units)	The amount of lead in sample. This is the exact value (without units) or "Non-detect" or "Below Reporting Limit" . "Non-detect" means there was no lead detected in the sample. "Below Reporting Limit" means that lead was detected in the sample but at a level below the reporting limit, which is the smallest concentration of an analyte that can be reported by a laboratory. This information will be taken from sample results from the laboratory. This is a required field and must be filled in.
	Unit of Measure	The unit of measurement of the lead in sample.
	Lead Sample Result in ppb (auto-calculated)	The amount of lead in the sample in parts per billion. This is auto-calculated from the lead result and unit of measure.
	Type of Sample	The type of sample: primary or first-draw, follow-up flush, and sequential. **Primary or first-draw sample** is collected after an 8-18 hour stagnation period and at the beginning of the day before water has been used at the facility. **Follow-up flush sample** is collected when the primary or first-draw sample yields a high lead result. The fixture is flushed before collecting a sample to determine if the lead is from the fixture itself or from another source. **Sequential sampling** is more advanced and would occur if a follow-up flush sample also yielded a high lead result. Sequential samples are collected as a series of samples to determine the source of lead.
	Testing Status	Indicates where your facility is in the 3Ts process. The choices are "Initial Testing" or "Taking Action" (for those conducting testing after taking follow-up, remediation, or replacement actions).
	Who was the result of the lead sample communicated to?	Indicates who your facility has communicated lead results to. Communication can include press releases, letters/fliers, mail/newsletters, website/social media posts, and presentations.

	What follow-up actions has your facility implemented or planned to implement to reduce lead exposure?	This indicates whether the facility has implemented or is planning to implement follow-up actions. If the sample result exceeds the 3Ts Lead Trigger Level, you should complete follow-up actions, remediation, replacement, or a combination of the three for the outlet the sample result corresponded to. **Follow-up actions** are short-term measures that may include but are not limited to steps such as follow-up testing; communication; issuing do not drink orders; providing students with water bottles to bring water from home; or temporarily placing fountains out of commission. This does not include activities related to remediation or replacement. This is a required field and must be filled in.
	What is the status of these follow-up actions?	This indicates whether these actions have been planned, are in-progress, or have been completed.
	What remediation actions has your facility implemented or planned to implement to reduce lead exposure?	This indicates whether the facility has implemented or is planning to implement remediation actions. If the sample result exceeds the 3Ts Lead Trigger Level, you should complete follow-up actions, remediation, replacement, or a combination of the three for the outlet the sample result corresponded to. **Remediation actions** can be short-term or long-term activities, which may include but are not limited to routine maintenance, such as cleaning debris from aerators; initiating protocols for flushing the building's piping system; or turning off contaminated outlets. This does not include fixture or outlet replacement. This is a required field and must be filled in.
	What is the status of these remediation actions?	This indicates whether these actions have been planned, are in-progress, or have been completed.
	What replacement actions has your facility implemented or planned to implement to reduce lead exposure?	This indicates whether the facility has implemented or is planning to implement replacement actions. If the sample result exceeds the 3Ts Lead Trigger Level, you should complete follow-up actions, remediation, replacement, or a combination of the three for the outlet the sample result corresponded to. **Replacement** here refers to permanent long-term strategies, which include but are not limited to replacing fixtures or internal piping in the facility. This is a required field and must be filled in.
Facility Tally	What is the status of these replacement actions?	This indicates whether these actions have been planned, are in-progress, or have been completed.
	Notes/Comments	This field is for you to include additional details not included in previous columns (e.g., more information about taking action, location notes, description of "other" outlet type, details about filters/aerators, color of the water when sampled, etc.).
	School NCES ID	This field is autopopulated from the Cover Sheet.
	City	This field is autopopulated from the Cover Sheet.
	State	This field is autopopulated from the Cover Sheet.
	Name of School	This field is autopopulated from the Cover Sheet.
	Type of Facility	This field is autopopulated from the Cover Sheet.
	3Ts Lead Trigger Level (in ppb)	This field is autopopulated from the Cover Sheet.
	School District (if applicable)	This field is autopopulated from the Cover Sheet.
	Number of Students at the School	This field is autopopulated from the Cover Sheet.
	Sampling Begin Date	The date the facility began sampling. This field is autopopulated using data from the Raw Sample Data sheet.
	Sampling End Date	The date the facility ended sampling. This field is autopopulated using data from the Raw Sample Data sheet.
	Number of Samples Collected	The total number of samples collected within a facility. This field is autopopulated based on the number of samples recorded on the Raw Sample Data sheet.
	Number of Samples with Lead Detected	The total number of samples with lead detected within a facility. This field is autopopulated based on what is filled in for Sample Results, which are required fields on the Raw Sample Data sheet.
	Number of Samples with Lead Detected Above the 3Ts Lead Trigger Level	The total number of samples with lead detected above the 3Ts lead trigger level within a facility. These sample results would trigger additional activities (follow-up, remediation, or replacement) to reduce exposure to lead. This field is autopopulated based on what is filled in for Sample Results, which are required fields on the Raw Sample Data sheet.
	Number of Outlets Requiring Follow-Up	This indicates the number of outlets tested where follow-up has been or will be implemented. This is based on sample results for individual outlets. Note that outlets with sample results above the 3Ts Lead Trigger Level should require follow-up, remediation, replacement, or a combination of actions. This field is autopopulated based on the what is filled in on the Raw Sample Data sheet.
	Number of Outlets Requiring Remediation	This indicates the number of outlets tested where remediation has been or will be implemented. This is based on sample results for individual outlets. Note that outlets with sample results above the 3Ts Lead Trigger Level should require follow-up, remediation, replacement, or a combination of actions. This field is autopopulated based on the what is filled in on the Raw Sample Data sheet.
	Number of Outlets Requiring Replacement	This indicates the number of outlets tested where replacement has been or will be implemented. This is based on sample results for individual outlets. Note that outlets with sample results above the 3Ts Lead Trigger Level should require follow-up, remediation, replacement, or a combination of actions. This field is autopopulated based on the what is filled in on the Raw Sample Data sheet.

Return to Facility Tally

State Abbreviation	Select a State Name	Select the Audience	Sample Drop Down
AL	Alabama	Staff	Non-detect
AK	Alaska	Parents	Below Reporting Limit
AS	American Samoa	Public	
AZ	Arizona	Staff and parents	
AR	Arkansas	Staff and public	
CA	California	Parents and public	
CO	Colorado	Staff, parents, and public	
CT	Connecticut		
DE	Delaware		
DC	District of Columbia		
FL	Florida		
GA	Georgia		
GU	Guam		
HI	Hawaii		
ID	Idaho		
IL	Illinois		
IN	Indiana		
IA	Iowa		
KS	Kansas		
KY	Kentucky		
LA	Louisiana		
ME	Maine		
MD	Maryland		
MA	Massachusetts		
MI	Michigan		
MN	Minnesota		
MS	Mississippi		
MO	Missouri		
MT	Montana		
NE	Nebraska		
NV	Nevada		
NH	New Hampshire		
NJ	New Jersey		
NM	New Mexico		
NY	New York		
NC	North Carolina		
ND	North Dakota		
MP	North Mariana Is.		
OH	Ohio		
OK	Oklahoma		
OR	Oregon		
PA	Pennsylvania		
PR	Puerto Rico		
RI	Rhode Island		

Sample Date	Number of Samples collected	Samples with lead	Samples exceeding trigger
3/2/2020	1	TRUE	TRUE
3/31/2020	1	FALSE	FALSE
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Follow-up Activities
Select an Option
None
Follow-up Testing
Issue Do Not Drink Order
Provide Water Bottles
Temporarily Place Outlet Out of Commission
Combination of Activities
Other

Remediation Activities
Select an Option
None
Routine Maintenance (e.g., clean aerators)
Flushing
Turn off Outlet
Combination of Activities
Other

Replacement Activities	Select Status
Select an Option	N/A
None	Planned
Replace Fixture	In-progress
Replace Plumbing/Internal Piping	Completed
Combination of Activities	
Other	

Units	Multiplier
ppm OR mg/L	1000
ppb OR µg/L	1

Number of follow-up implemented (or to-be-implemented) activities to reduce lead exposure	Number of remediation activities implemented (or to-be-implemented) to reduce lead exposure
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SC	South Carolina
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TN	Tennessee
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UT	Utah
VT	Vermont
VI	Virgin Islands
VA	Virginia
WA	Washington
WV	West Virginia
WI	Wisconsin
WY	Wyoming

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Message

From:	Steve Via [SVia@awwa.org]
Sent:	12/13/2019 1:32:00 PM
To:	Helm, Erik [Helm.Erik@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]; Dorjets, Vlad EOP/OMB [Vladik_Dorjets@omb.eop.gov]
CC:	Tracy Mehan [tmehan@awwa.org]
Subject:	AWWA Comments on LCR Revision ICR
Attachments:	2019 12 13 AWWA Comments on LCR Revision ICR.pdf

Good morning,

This morning the American Water Works Association filed the attached comments in www.regulations.gov in the LCR Revisions docket. If you have any questions regarding the attached please feel free to contact Tracy Mehan or me. As noted in the attached, AWWA anticipates filing more detailed comments in 2020 during the comment period on the LCR Revision proposal, itself. Those comments may also be helpful to you in finalizing the Paperwork Reduction Act review of the LCR Revisions Information Collection Request.

Thank you for your time and attention.

Best regards,
Steve Via

Steve Via
Director of Federal Relations
American Water Works Association
1300 Eye Street NW, Suite 701W
Washington, DC 20005-3314
Office 202.628.8303 | **Direct** 202.326.6130
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American Water Works Association

Dedicated to the World's Most Important Resource

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December 13, 2019

Office of Information & Regulatory Affairs
Office of Management and Budget
725 17th Street, NW
Washington, DC 20503

RE: National Primary Drinking Water Regulations: Proposed Lead and Copper Rule Revisions, Docket No. EPA–HQ–OW-2017-0300, ICR Reference No. 201911-2040-002

Dear Sir or Madam:

The U.S. Environmental Protection Agency's (EPA) Proposed Lead and Copper Rule (LCR) Revisions when finalized will provide important, positive changes that will lead to further reduction of lead in the nation's drinking water. It is important that the rule when finalized is implementable and that water systems focus on executing the required tasks including effectively communicating results to customers and the other required outreach in their communities. EPA should avoid requirements that create unproductive reporting burdens on water systems and state primacy agencies. The American Water Works Association (AWWA) appreciates the changes the Office of Information & Regulatory Affairs (OIRA) has already requested of EPA to simplify rule implementation. The following recommendations build upon those revisions.

The information collection request supporting the proposed LCR revisions warrants substantial review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. While Section 1401(1)(D) of SDWA may accord EPA the authority to require information to support oversight and implementation, such requirements must be prudent and efficient and consistent with the Paperwork Reduction Act. In order to meet the Office of Management and Budget's 30-day comment deadline, the observations shared at this time are not as complete as the filing AWWA anticipates submitting at the close of the EPA's comment period on the proposed LCR Revisions. In brief, the proposed revisions require:

1. A level of documentation and paperwork tracking that represents a substantial administrative burden to community water systems and state SDWA primacy agencies.
2. Community water systems to submit paperwork that they have no legal means to reliably obtain and to hold them liable for failure to submit such documentation to the primacy agency.

3. Data reporting at a frequency and specificity that are not necessary to support EPA oversight and enforcement as stated by EPA in the Information Collection Request.

4. Data collection and management beyond the limited duration of the Information Collection Request (ICR) as EPA's submittal implies that the burden associated with this ICR is limited to the initial start of rule implementation, when there are substantial unnecessary paperwork burdens that begin after that three-year period and continue well into the future that are unrecognized in the Agency request.

5. Paperwork that will not be beneficial to EPA oversight and enforcement, as EPA is not prepared with an information management system capable of receiving and managing that data now or in the foreseeable future.

As shown in Attachment B there are 35 significant new, onerous paperwork requirements under the proposed LCR revisions. Exhibits 2 and 3 in the ICR for the proposed LCR revisions are a tremendous over-simplification of the additional information required by the proposed rule. Some are necessary to implement the rule and that need should not be minimized. Submission however of details required on an annual basis in the current proposal are not necessary for implementation. For example, the proposal requires water systems to:

1. Submit data annually summarizing the number of schools and child care facilities tested,

2. Document which schools and childcare facilities have refused to provide access to their facilities,

3. Provide actual observed data from follow-up samples taken during find-and-fix monitoring campaigns to the primacy agency,

4. Annually certify and demonstrate that the system is adhering to public education notification requirements

5. Maintain an inventory of pitcher filters and cartridges, certifications that the pitchers are certified for lead reduction, and records of pitcher distribution.

6. Track, implement public education measures (e.g., notifications, provision of filters and testing) for, and obtain state approval to de-list service lines identified as having "unknown materials" where the initial listing of these lines could be dramatically larger than the listing of lines identified as "lead."

By revising the rule in three respects, EPA could significantly reduce the burden on water systems and states without impairing EPA's ability to oversee and enforce the proposed rule or state's ability to implement the rule provisions. EPA should remove the reporting requirements and emphasize the following:

1. Maintain and clarify the proposed provisions for water systems to develop standard operating procedures for lead service line replacement and public education. Such procedures should include maintenance of logs of activity undertaken to comply with the LCR requirements. These logs would be subject to review by the state upon request and

summaries adequate to demonstrate good-faith adherence to SOPs could be provided to the state periodically.

2. Replace the proposed requirements for documentation of "refusal" to participate in either lead service line replacement, school sampling, or childcare facility sampling with provisions in the above-mentioned SOPs for maintenance of logs of steps taken to engage property owners, schools, and childcare facilities.

3. More effectively use existing opportunities to review compliance with the LCR provisions, lead and copper data summaries, and effectiveness of corrosion control treatment.

All state and local governments and their respective subdivisions are subject to laws that provide for freedom of information requests. Eighty-five percent of community water systems are such entities. Moreover, the requirements of the current and proposed rule already require making the most pertinent information to monitor water system performance available to the public. The proposed requirements are duplicative.

For almost a decade, EPA has been working to develop a "cloud-based" data warehouse to replace the Safe Drinking Water Information System. Last month EPA determined that it would need to re-start development of this data warehouse, essentially starting from the beginning. EPA has released a tool for water systems submitting laboratory-generated compliance data and some ancillary information, the Compliance Monitoring Data Portal (CMDP). At last report 10 states with primacy for SDWA utilize CMDP, with the goal of 15 states using CMDP by the end of 2019. At present, CMDP is not designed to receive much of the data that is required by the proposed LCR revisions. Absent such a tool, much of the data captured as a result of this onerous paperwork burden would not be available for the users identified in section 2(b)(ii) of EPA's ICR.

Monitoring and reporting (M&R) violations do not directly reflect public health risks but can be a very significant percentage of drinking water violations under the Safe Drinking Water Act (SDWA). Just like health-based violations, M&R violations can erode public trust. The more extensive the paperwork requirements resulting from a rule are, the more likely state and water system resources will be spent not only in managing that paperwork but in managing violations from mistakes in adhering to those filing requirements. Unnecessarily complicated monitoring and reporting requirements impose not only the immediate administrative burden on primacy agencies and water systems, but also the consequences of instances when there are mistakes in filing required paperwork.

If you have any questions regarding this correspondence, please contact me or Steve Via at 202.326.6130 or svia@awwa.org.

Best regards,

G. Tracy Mehan, III

G. Tracy Mehan, III
Executive Director – Government Affairs
American Water Works Association

Attachments - 2

cc: Lisa Christ, EPA/OW/OGWDW
Erik Helm, EPA/OW/OGWDW

Who is AWWA

The American Water Works Association is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founded in 1881, the Association is the largest organization of water supply professionals in the world. Our membership includes more than 4,000 utilities that supply roughly 80 percent of the nation's drinking water and treat almost half of the nation's wastewater. Our 50,000-plus total membership represents the full spectrum of the water community: public water and wastewater systems, environmental advocates, scientists, academicians, and others who hold a genuine interest in water, our most important resource. AWWA unites the diverse water community to advance public health, safety, the economy, and the environment.

Attachment A – Elements of Paperwork Reduction Act Certification

The following is a summary of the topics, regarding the proposed collection of information, that EPA has certified under the PRA with respect to the proposed LCR Revisions:

(a) It is necessary for the proper performance of agency functions;

(b) It avoids unnecessary duplication;

(c) It reduces burden on small entities;

(d) It uses plain, coherent, and unambiguous language that is understandable to respondents;

(e) Its implementation will be consistent and compatible with current reporting and recordkeeping practices;

(f) It indicates the retention periods for recordkeeping requirements;

(g) It informs respondents of the information called for under 5 CFR 1320.8 (b)(3) about:

- (i) Why the information is being collected;
- (ii) Use of information;
- (iii) Burden estimate;
- (iv) Nature of response (voluntary, required for a benefit, or mandatory);
- (v) Nature and extent of confidentiality; and
- (vi) Need to display currently valid OMB control number;

(h) It was developed by an office that has planned and allocated resources for the efficient and effective management and use of the information to be collected.

(i) It uses effective and efficient statistical survey methodology (if applicable); and

(j) It makes appropriate use of information technology.

Attachment B – Additional Paperwork Submittals to SDWA Primacy Agencies

The following is an initial compilation of additional paperwork submittals required by the proposed LCR Revisions. These submissions are in addition to current paperwork requirements under the existing LCR. These 35 items are listed because they represent substantial increases to the paperwork burden placed on water systems and state primacy agencies.

Count	New rule element requiring state accepting, reviewing, accepting, and / or deciding	Initial Timeframe	Recurrence
1	Lead service line inventory*	3 years	Annual
2	Determination that LSL inventory meets rule requirements	None specified	
3	Lead service line replacement plan*	3 years	
4	Determination of acceptable lead service line replacement rate	3 years	
5	Determination that replacement plan includes required components	None specified	
6	Receive, review, and respond to additional samples resulting from rule requirements	Approx. 3 1/2 years	Every six months
7	Approve reduced in home tap sample monitoring schedules after systems have met initial revised rule monitoring requirements	Approx. 3 years	Every six months
8	Approve reduced in water quality parameter sample monitoring schedules after systems have met initial revised rule monitoring requirements	Approx. 3 years	Every six months
9	Review revised LCR monitoring plans to reflect new sample pool requirements	3 years	
10	Revise all existing corrosion control treatment plans based on calcium carbonate	None specified	
11	Revise all existing corrosion control treatment plans that are premised on use of polyphosphate	None specified	
12	Modification of system WQP monitoring plan where corrosion control was based on calcium carbonate	None specified	
13	Modification of system WQP monitoring plan where corrosion control was based on use of polyphosphate	None specified	
14	Determine if and which "additional monitoring data" to include in 90th percentile calculation	Approx. 3 1/2 years	Every six months
15	Tier 1 PN certification	<10 days**	Ad hoc
16	Copy of Tier 1 PN notice to Primacy Agency	<24 hours**	Ad hoc
17	Copy of Tier 1 PN notice to EPA Administrator	<24 hours**	Ad hoc
18	Follow-up Pb samples for every individual tap sample that has a lead observation above 15 ppb	<30 days**	Ad hoc
19	Documentation to substantiate every failure to re-sample Pb following every individual tap sample that has a lead observation above 15 ppb	< 30 days of high value recognition**	Ad hoc

Count	New rule element requiring state accepting, reviewing, accepting, and / or deciding	Initial Timeframe	Recurrence
20	Follow-up WQP samples for every individual tap sample that has a lead observation above 15 ppb	< 5 days of high value recognition**	Ad hoc
21	Assure system met deadline for Find-and-Fix submittal after every individual observation exceeding 15 ppb	< 6 months of high value recognition**	Ad hoc
22	Modification of system WQP monitoring plan with every individual tap sample that has a lead observation above 15 ppb	Prior to next WQP sample series**	Ad hoc
23	Instruct system based on Find-and-Fix data if additional data collection, modification of CCT, continuing current CCS, or CCS is necessary	< 6 months of system submittal**	Ad hoc
24	Assure that system completes any required CCT modifications	<12 months of instruction to system**	Ad hoc
25	Decide if state is going to set specific resource requirements for lead service line inventory	< 2 years (primacy package)	
26	Decide if state is going to set specific lead service line material verification methodologies	< 2 years (primacy package)	
27	Determine if lead service line replacement rate higher than 3% is appropriate for individual systems that exceed the lead action level.	None specified	Ad hoc
28	Approval of representative point-of-entry-to-the-distribution-system WQP sample sites for ground water systems with multiple wells	3 years	Ad hoc
29	Receive and evaluate copies of tap sampling protocols being used	3 years	Every six months
30	Receive and evaluate documentation for sample pools with insufficient lead service lines	3 years	Every six months
31	Receive and evaluate certification that all systems with lead service lines conducted required lead public education outreach (households with lead service lines, households with observed lead values, outreach following a trigger level or lead action level exceedance, outreach to households prior to LSL replacement, outreach to households associated with disturbed lead service lines).	<4 1/2 years	Annual
32	Receive and evaluate certification of system efforts to identify schools and child care facilities including reviewing customer records and requesting lists of schools and child care facilities from the primacy agency or other licensing agency.	<4 1/2 years	Annual
33	Receive and evaluate required data to substantiate compliance with public education monitoring requirements including: number of schools and childcare facilities in each individual system, sampled by	<4 1/2 years	Annual

Count	New rule element requiring state accepting, reviewing, accepting, and / or deciding	Initial Timeframe	Recurrence
	each individual system, refused sampling, efforts to obtain required in-home samples, compliance with alternative state school and childcare facility sampling programs		
34	Determinations to utilize small system flexibility provisions and associated requirements.	3 years	Ad hoc
35	Receive and evaluate annual certifications that required lead service line replacement rates are being achieved. Certifications include documentation of the number and location of service lines replaced, and certification of all associated public education requirements are being met.	3 years	Annual

* After initial filing, the number of systems impacted on an ongoing basis will be smaller
** Timeframe is triggered by an event rather than initial rule promulgation.

Message

From: Steve Via [SVia@awwa.org]
Sent: 11/20/2019 9:35:45 PM
To: Christ, Lisa [Christ.Lisa@epa.gov]
Subject: RE: AWWA Webinar on LCR Revisions

Yes; will get "95" fixed. Will be putting this set of slides through another round of reviews tonight internally as well.

Thanks,
Steve

Steve Via
Director Federal Relations, AWWA | 202.326.6130

From: Christ, Lisa <Christ.Lisa@epa.gov>
Sent: Wednesday, November 20, 2019 4:32 PM
To: Steve Via <SVia@awwa.org>
Subject: RE: AWWA Webinar on LCR Revisions

Hi Steve,
I'll see if one of the LCRR team can take a look. One thing I noticed on your rotating slide deck is the following:

- Will your system exceed the lead action level given new sample pool and 95th percentile calculation? The lead trigger level?
  (See Sec. 141.80(c)(4), page 84 FR 61745 for required calculation.)

The calculation to determine if tap sampling exceeds the lead action level **remains the 90th%**
I'll try to get other comments to you tomorrow morning.

Lisa

From: Steve Via <SVia@awwa.org>
Sent: Wednesday, November 20, 2019 3:52 PM
To: Christ, Lisa <Christ.Lisa@epa.gov>
Subject: AWWA Webinar on LCR Revisions

Lisa,

Attached is a summary and link to a webinar AWWA is hosting tomorrow on the LCR Revisions. I mentioned the webinar in passing at WQTC.

Attached are the current drafts of the slide decks for the presentations. If anyone on the LCR Revisions team has time to peruse the attached, it would be great to know if we are misrepresenting the proposal in any way.

The webinar is free to AWWA members so the team there at EPA has access should they have interest and time to listen in.

Best regards,
Steve

Steve Via
American Water Works Association
1300 Eye Street NW, Suite 701W
Washington, DC 20005-3314
Office 202.628.8303 | **Direct** 202.326.6130
svia@awwa.org | www.awwa.org

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American Water Works Association
Dedicated to the World's Most Important Resource ®

Message

From: Steve Via [SVia@awwa.org]
Sent: 11/20/2019 8:52:08 PM
To: Christ, Lisa [Christ.Lisa@epa.gov]
Subject: AWWA Webinar on LCR Revisions
Attachments: 2019 11 20 Cornwell CCT.pptx; 2019 LCRR_Slabaugh.pptx; LCR revision webinar Nov 2019 SAES.pptx; 2019 11 21 Webinar Flyer.docx; 2019 11 20 Intro rotating slide deck.pptx

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Best regards,
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svia@awwa.org | www.awwa.org

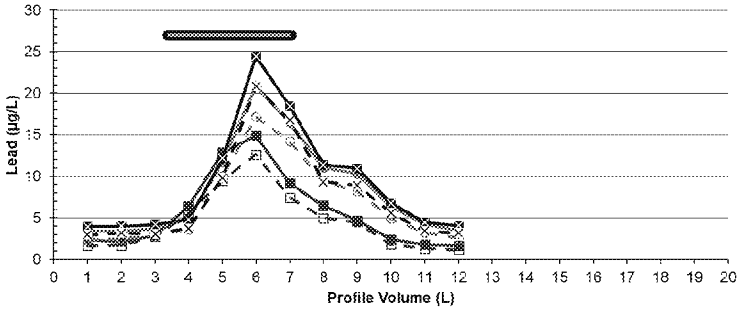
THE PROPOSED LCR REVISIONS FROM A USER PERSPECTIVE

David A. Cornwell
CEO
Cornwell Engineering Group

THIS PRESENTATION WILL FOCUS ON

- When a new Corrosion Control Study (CCS) may be needed
  - A look at sampling requirements and how that might impact reported lead levels
  - The new trigger level and its impact on when a CCS is required
  - Changing sources or blending
  - State and EPA discretion
- How does the new rule describe what a CCS is and how to conduct it----several important changes
- New "find and fix" requirements

SAMPLING FOR LEAD AND COPPER IN THE PROPOSAL



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SAMPLING FOR LEAD AND COPPER IN THE PROPOSAL

- No changes to method in proposal
  - Proposed as 1st L for lead and copper
  - Sampling methods are same --clarified that need use wide mouth bottles, no preflush of water the night before, aerators on
- Lead and Copper sampled in same homes and same bottle—no change
- EPA is requesting comment on using 5th L instead of 1st L

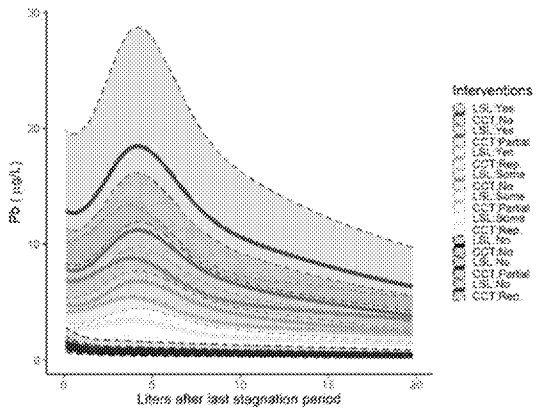
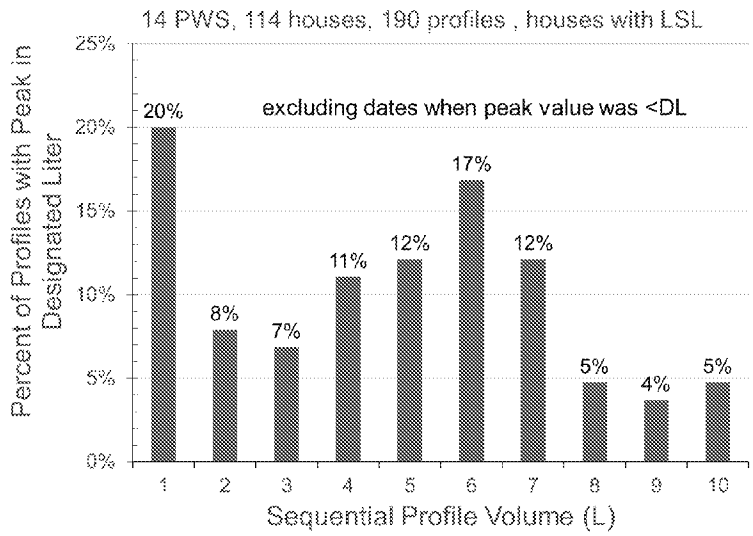


Figure 6-10 from EPA's EA
Based on a model that assumes 5th L is peak

EVALUATION OF LEAD SAMPLING METHODS: ACTUAL DATA DOESN'T LOOK LIKE THE MODEL



All homes have LSL

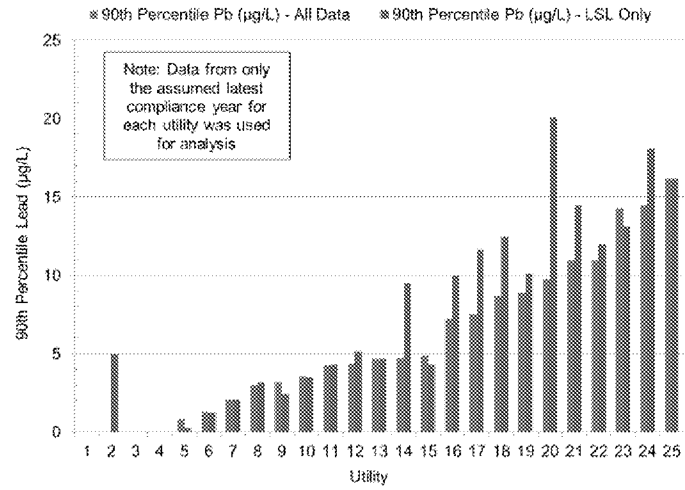
Cornwell and Brown WRF 4569 and 4713

BUT THERE ARE PROPOSED SAMPLING CHANGES

- Sampling provisions are now based on whether lead service lines are present or not, and if they are present if there are enough for all sampling sites
- Unknowns do not count as LSL for sampling
- Lead goosenecks and galvanized piping do not count as lead lines for sampling
- Lead lines MUST be verified
- A location can have a partial or full LSL for sampling
- Continually re-evaluate based on inventory update
- Try to reuse existing sites (same data base) if feasible

FOR UTILITIES THAT HAVE LSLs HOW MIGHT 90% CHANGE

- All samples collected for calculation of lead level must come from Tier 1 or 2—homes, buildings with LSLs
- These utilities all have a CCT method in place-a verity of methods used



Calculations from our data set on homes with LSLs

About 40 % of these utilities Would be over TL of 10 ppb

SITE SELECTION IF UTILITY HAS SOME LSL BUT NOT ENOUGH FOR ALL REQUIRED LOCATIONS

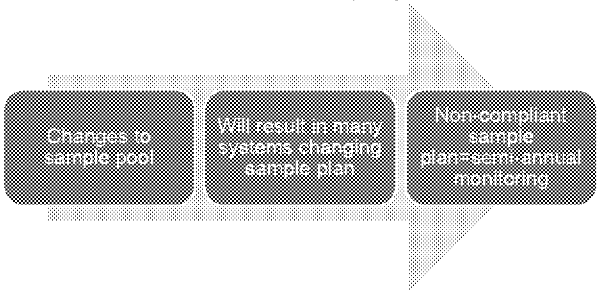
- Use all Tier 1 and 2 present and verified
- Rest can be Tier 3 then 4
- If a utility takes more samples than the required number-----
  - First use all Tier 1 and 2 sites
  - Then of all the Tier 3 and 4 collected, use the highest values until required number of samples is met, do not use any more samples than the required number to calculate TL or AL

SITE SELECTION IF UTILITY HAS NO LSL

- Use all Tier 3 and 4
- Use ALL samples taken during the monitoring period

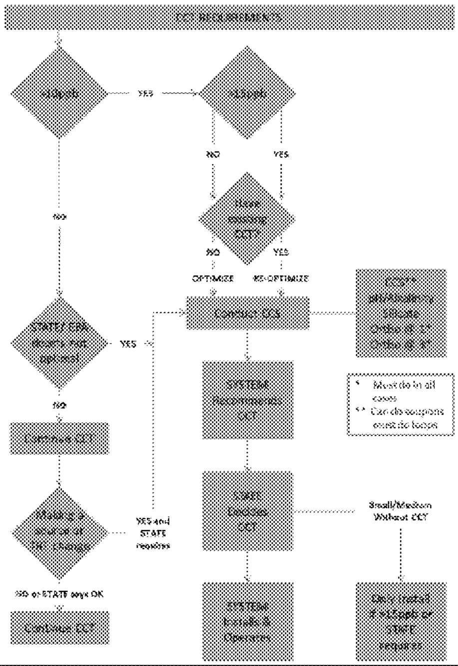
FREQUENCY OF SAMPLING AT RULE START

- Prior to rule start utility can collect qualified sample pool data:
- If Pb or Cu > AL : semi-annual sampling required
- If Pb between TL and AL : annual sampling required
- If LSL present and < TL—annual monitoring (seems language conflict, elsewhere says all LSL systems semi-annual)
- Any system without compliant data –semi-annual
- Systems without LSL, < TL—tri-annual sampling

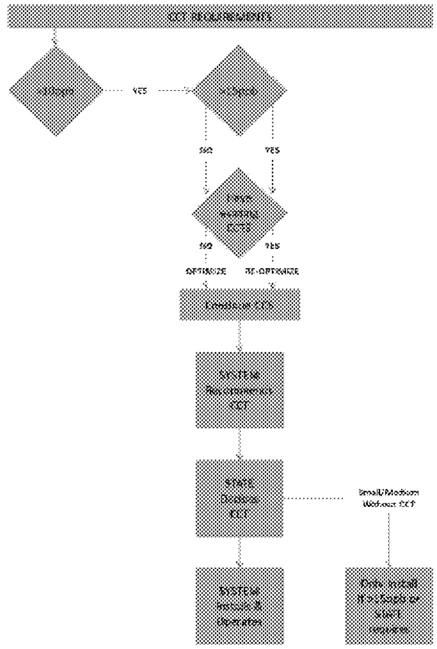


SO NOW WE HAVE A CALCULATED TL AND AL— WHEN IS A CORROSION CONTROL STUDY (CCS) REQUIRED?

NEXT SLIDES BREAK THIS INTO COMPONENTS



- A CCS is required when TL is exceeded
- The Proposal assumes that this is main avenue to new CCS



Proposal refers to re-optimize if have CCT or optimize if no CCT

But, CCS requirements are the same for both

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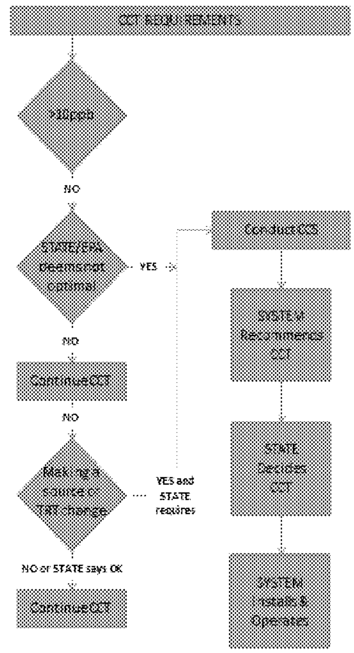
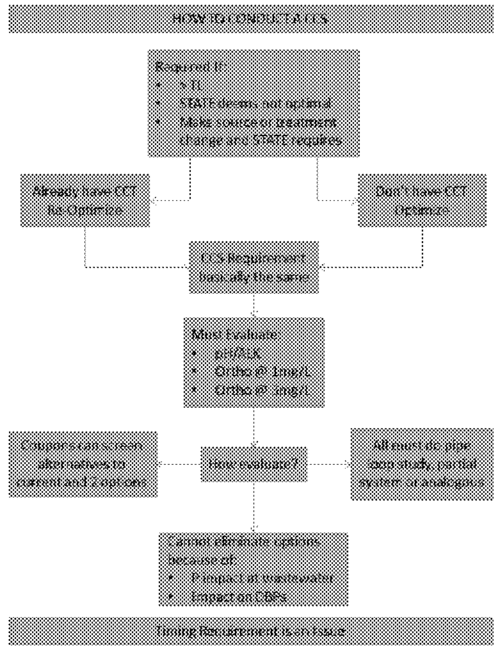
Other triggers for CCS include:

- State deems you are not optimal
- EPA region has stated authority to overrule
- If making a source or treatment change



- Specific new requirements on how to do a CCS
- A loop study was stated as needed due to scale impact concerns
- Requires CCS complete in 18 mo— difficult to complete in 18 mo for a loop study



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SMALL SYSTEMS (10,000 OR 3300) HAVE PROPOSED FLEXIBILITY

- Applies to CWSs serving 10,000 or fewer persons and all NTNCWS > TL
- Compliance alternatives for small CWSs:
  - full lead service line replacement
  - installation and maintenance of optimized corrosion control treatment, and
  - installation and maintenance of point-of-use (POU) devices-all homes even without LSL

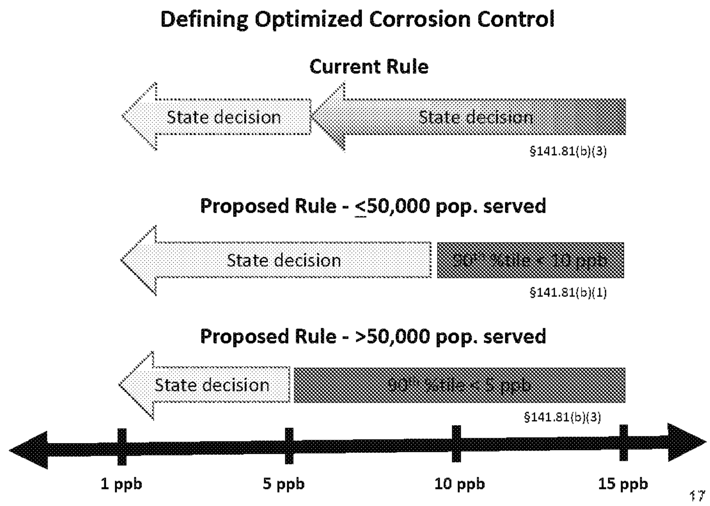
To use full lead line replacement as alternative to CCT
requires utilities to have authority or permission to remove every customer portion
Have 15 yrs to complete—notify for 15 years?
Could still have high lead from home

Is this realistic?

Small System CCT requires CCS described earlier

ALTERNATIVES TO ACHIEVE OCCT: SYSTEM MUST HAVE APPROVED CCT TO USE THIS

- Small or medium systems
  - < TL for 2, 6-month monitoring periods
- Any system
  - < 5 ppb for 2, 6-month monitoring periods



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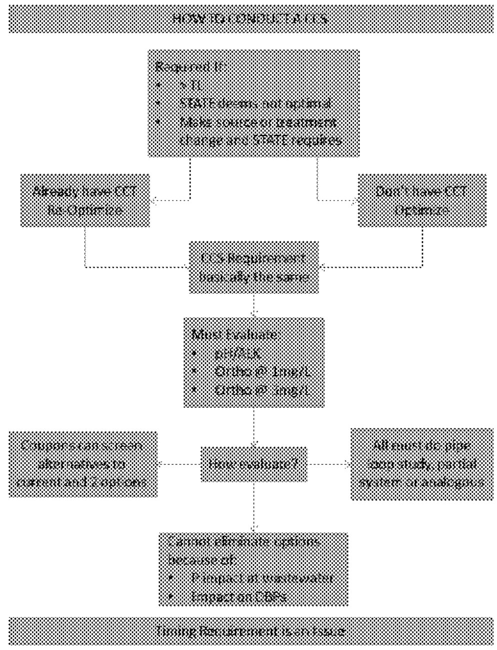

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MANY MECHANISMS CAN IMPACT PB

- Lead Solubility
- Galvanic Corrosion
- Sequestrant Presence
- ORP
- Ca, Al, Fe, Mn
- Water use Rate
- Water Flow Rate in Pipes/Plumbing
- Scale Disruption
- Microbial Growth

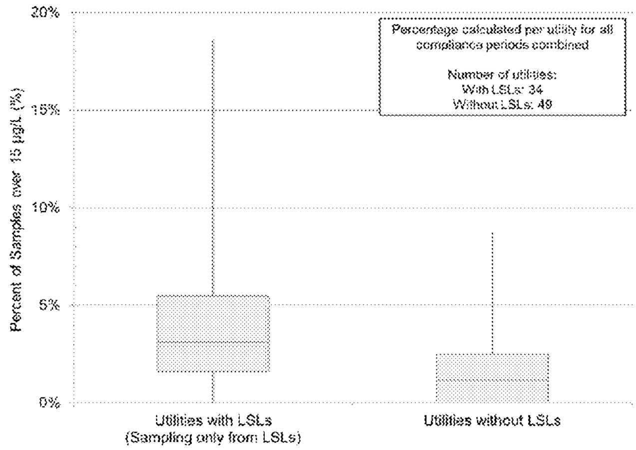
Not all changes impact scales
Are loop studies always needed?

PERHAPS A TOOLBOX OF CCS DEMONSTRATION OPTIONS IS APPROPRIATE

	Solubility	Galvanic	Sequestrant	ORP	Ca, Al, Fe, Mn	Water Use & Flow Rate	Scale Disruption	Microbial
Theoretical Solubility	M			M				
Research Actual Solubility	M+			M+				
Batch Coupon Weight Loss								
Batch Coupon Solubility	H		H	L-M			L-M	
Batch Harvested Pipe	H	H	H	H	M		M	
Batch Galvanic Tests		M						
"Loop" Virgin Pipes	M	M	L	L-M			L-M	
"Loop" Coupons	M	M	L	L-M			L	
Flow Through Harvested Pipe	L	H	L	H	H	H	H	
Scale Analysis	M	M	M	H	H		M	
Field Studies						M	M	H

THERE ARE NEW PROPOSED REQUIREMENTS REFERRED TO AS "FIND AND FIX"

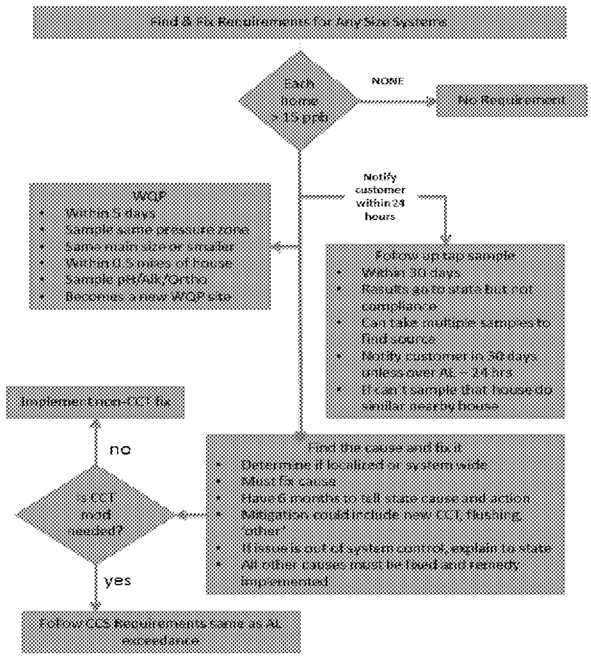
- Applies to any home that has a lead value of 15 ppb (AL)
- Not clear if this includes customer requested or extra samples collected



In our data set, for utilities with LSLs:

median number of homes > 15 ppb is ~ 3% of all homes in sample pool
75 percentile ~ 5%

This may change with new pool



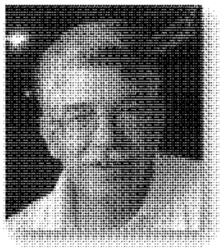
Find & Fix Requirements for Any Size Systems
Each home > 15 ppb
NONE
No Requirement
Notify customer within 24 hours
WQP
Within 5 days
Sample same pressure zone
Same main size or smaller
Within 0.5 miles of house
Sample pH/Alk/Ortho
Becomes a new WQP site
Folow up tap sample
Within 30 days
Results go to state but not compliance
Can take multiple samples to find source
Notify customer in 30 days unless over AL – 24 hrs
If can't sample that house do similar nearby house
Implement non-CCT fix
no
Is CCT mod needed?
yes
Find the cause and fix it
Determine if localized or system wide
Must fix cause
Have 6 months to tell state cause and action
Mitigation could include new CCT, flushing, "other"
If issue is out of system control, explain to state
All other causes must be fixed and remedy implemented
Folow CCS Requirements same as AL exceedance

SUMMARY

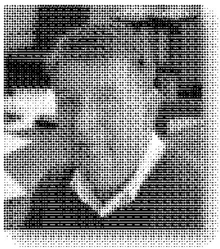
- The proposed Rule includes changes that will impact many utilities
- Utilities need to understand how the changes affect them-might start working on inventory, sample pool and data analysis of LSL sites
- States' role will be expanded
- As written, rule is very confusing and gaps in action requirements

Remember, the rule's intent is to protect the public health of our customers, particularly the children

PROPOSED LEAD AND COPPER RULE REVISIONS–



Steve Estes-Smargiassi
Director of Planning and Sustainability
Massachusetts Water Resources Authority



David Cornwell
President
Cornwell Engineering Group

Rebecca Slabaugh
Drinking Water Practice Lead
Arcadis

ASK YOURSELF...

- Will your system have to submit a revised sampling plan to the State reflecting revised definitions for Tier 1 and 2 sample sites?
  (See § 141.86, page 84 FR 61759)

- Will your system exceed the lead action level given new sample pool and 95th percentile calculation? The lead trigger level?
  (See Sec. 141.80(c)(4), page 84 FR 61745 for required calculation.)

- When you evaluate multiple years of historical lead data filtered for proposed LCR sample pool and compliance calculation, is your system going to be reliably under the trigger and action levels?

Comments are due on Lead and Copper Rule Revisions on or before **January 13, 2020**; comments specific to paperwork burden associated with the revisions are due on or before **December 13, 2019**.

Submissions may be made electronically at www.regulations.gov. The docket number is **EPA-HQ-OW-2017-0300**.

AWWA and a number of other organizations have requested a longer comment period. To-date, EPA has not responded to those requests.

THE PROPOSED LCR REVISIONS FROM A UTILITY PROSPECTIVE

Stephen Estes-Smargiassi

Director of Planning and Sustainability

Massachusetts Water Resources Authority

IT'S BEEN A LONG ROAD

- These Revisions Have Been Under Development since 2004
- AWWA and Utilities Have Been Actively Involved in Commenting and Providing Technical Information
- AWWA Developed the Lead Service Line Replacement and Flushing Standard
- National Drinking Water Advisory Council Recommendations December 2015
- AWWA Endorsed the NDWAC Recommendations
- "The American Water Works Association (AWWA) is committed to protecting public health through the reduction of exposure to lead in drinking water."

AWWA Policy Statement on Lead Service Line *Management* – A Good Road Map for Water System Action

- Identify and remove lead service lines over time, recognizing shared ownership and financial burden issues

- Work collaboratively to alert property owners of the risk of LSL and steps to reduce that risk

- Maintain optimum corrosion control treatment

- Recognize that as long as there is lead in contact with water, there is some risk

PUBLIC WATER SUPPLIERS – PROTECTING PUBLIC HEALTH

- Our Goal is public health protection
- Lead Levels in children's blood have declined 90 percent
- Lead Levels at our Customer's Taps Have Declined Dramatically
- But still more to be done

- Managing the Risk of Lead in Water is a Shared Responsibility
  - Public Water Suppliers
  - Our Customers
  - Public Health Officials and Health Providers

- Long Term Goals – Reducing Lead Corrosion and Removing Lead from Contact with Our Water

IT'S NOT ALL NEW!

- No Change in the lead Action Level of 15 ppb
- No Change in the lead MCLG of zero

- Does NOT Require Systems to Remove Lead Service Lines if Below the AL

- No substantive change in copper requirements

DEVELOPING INVENTORIES OF LEAD SERVICE LINES

- All Systems Must Develop an Inventory of Their LSL, Within Three Years of the Final Rule

- Must Include: LSL, Unknown Material, Non-Lead
- Galvanized downstream of lead, treated as lead
- Updated Annually
- Publicly Available; On-Line for Large Systems

- This is information our customers expect us to have and make available

- Must Develop a Removal Plan, Agree with State on Annual Rate, w/i three years

- Must Notify Customers Annually if LSL or Unknown

CHANGES IN SAMPLING PROCEDURES

- Codifies Sampling Procedures
  - Still stagnant, first draw samples
  - Wide mouth bottles
  - No pre-stagnation flush
  - No aerator removal

- If have any LSL, LCR samples must be from LSL, if available

- System 90th percentile is based on LSL and highest non-LSL samples, if any

- Removes installation date requirements for copper with lead solder

NEW TRIGGER LEVEL OF 10 ppb

- Revised Rule adds a new Trigger Level of 10 ppb

- Increase monitoring to annual
- Conduct corrosion control treatment study or re-optimization study
- Large systems must re-optimize

- Additional outreach to customers with LSL or unknown materials
- Implement LSL plan at agreed upon annual goals

SMALL SYSTEM FLEXIBILITY

- Community Water Systems, (CWS) less than 10,000
- Non-transient, non-community water systems (NTNCWS)

- If over Trigger Level of 10 ppb, select an option
- If over the Action Level of 15 ppb, implement option

  - Options other than installing CCT

  - Replace all LSL with 15 years
  - Install and Maintain Point of Use Devices
  -
  - Replace all lead bearing fixtures, within 1 year (NTNCWS)

SIGNIFICANT CHANGES IN NOTIFICATION REQUIREMENTS

- Notify customer if their sample is over AL with 24 hours
  - Plus "find and fix"

- If system is over the AL of 15 ppb:
- 24 hour public notification
  - Similar to confirmed *E. coli* contamination
- Based on WIIN Act and EPA assumption that any elevated lead is an acute risk

- Essentially no time to prepare
- No way to quickly close out the event

LEAD SERVICE LINE REPLACEMENT REQUIREMENTS

- Full replacement, main to house, required – limited exceptions
- If over the Trigger Level of 10 ppb
  - Replace based on plan and agreed rate – at least two years
- If over the Action Level of 15 ppb
  - Replace 3 percent annually – at least two years
- No test out provision based on sampling
- Provide pitcher filters w/i 24 hours for full or partial replacements
- If home owner replaces their part, system must replace public part w/i 3 months

SCHOOL AND CHILDCARE FACILITY SAMPLING

- Community Water System Must Sample:
  - 20 percent of all public and private schools annually – 5 samples each
  - 20 percent of all licensed childcare facilities – 2 samples each
- Develop a complete list and update every 5 years
- Provision for documenting refusal to sample

Message

From: Christ, Lisa [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=10DBD8E424704E43B5A50F74A4DAC626-LCHRIST]
Sent: 8/16/2018 3:20:09 PM
To: Lisa Janairo [ljanairo@csg.org]; Cook-Shyovitz, Becky [Cook-Shyovitz.Becky@epa.gov]
CC: Bowles, Jack [Bowles.Jack@epa.gov]
Subject: RE: EPA Speaker for Great Lakes-St. Lawrence Policy Institute
Attachments: LCR presentation for Great Lakes Leg Caucus-2egb.pptx; L.Christ.jpg

Hi Lisa,
Here's a short bio:
Lisa is the Chief of the Targeting and Analysis Branch in EPA's Office of Ground water and Drinking Water. Her branch is responsible for implementing requirements of the Safe Drinking Water Act to identify and evaluate contaminants that may pose a public health risk and are likely to be found in drinking water. Lisa's branch also responsible for developing new drinking water regulation for evaluated contaminants and revising national standards as needed to improve public health protection. The Targeting and Analysis branch is currently developing revisions to the lead and copper rule, finalizing EPA's codifying regulations for the Reeducation of Lead in Drinking Water Act that reduce the allowable lead content in plumbing materials, and a preparing a proposal for a new drinking water regulation for perchlorate. Lisa also has extensive experience in the development of tools, guidance and training to support effective implementation of drinking water regulations by states and public water systems. In addition, she worked on development of Ambient Water Quality Criteria for recreation under the Clean Water Act.

Attached are my presentation slides and a picture.

Let me know if you need anything else.

Lisa

From: Lisa Janairo [mailto:ljanairo@csg.org]
Sent: Tuesday, August 14, 2018 11:15 AM
To: Cook-Shyovitz, Becky <Cook-Shyovitz.Becky@epa.gov>; Christ, Lisa <Christ.Lisa@epa.gov>
Cc: Bowles, Jack <Bowles.Jack@epa.gov>
Subject: Re: EPA Speaker for Great Lakes-St. Lawrence Policy Institute

Thank you very much – all of you!

Lisa, please call me at 920.458.5910 when you have a chance so we can discuss the plans for the webinar. I greatly appreciate your willingness to be a speaker.

Best,
Lisa

From: "Cook-Shyovitz, Becky" <Cook-Shyovitz.Becky@epa.gov>
Date: Tuesday, August 14, 2018 at 10:10 AM
To: Lisa Janairo <ljanairo@csg.org>, "Christ, Lisa" <Christ.Lisa@epa.gov>
Cc: "Bowles, Jack" <Bowles.Jack@epa.gov>
Subject: RE: EPA Speaker for Great Lakes-St. Lawrence Policy Institute

Hi Lisa,

Lisa Christ, Chief, Targeting and Analysis Branch, Office of Ground Water and Drinking Water, will cover the webinar this Friday. I've copied her on this email.

Thanks for your patience!

Becky

From: Lisa Janairo <ljanairo@csg.org>
Date: Tuesday, August 7, 2018 at 3:45 PM
To: "Bowles.Jack@epa.gov" <Bowles.Jack@epa.gov>
Subject: EPA Speaker for Great Lakes-St. Lawrence Policy Institute

Dear Jack,

Thank you for helping to recruit one or two speakers for the Great Lakes Legislative Caucus's Great Lakes-St. Lawrence Policy Institute. As we discussed, I'm looking for speakers for the following sessions:

1. August 17, 10 – 11:30 am EDT: Web-Meeting 1, The Impacts of Impure Water on Public Health and the Economy
   The speaker would be the first of two and would have 30 minutes for a presentation on the public health hazard resulting from exposure to lead; relative risk from exposure to lead in drinking water versus other sources; and an overview of federal and state authority for regulating lead in drinking water. Five minutes will be available for Q&A afterward. The speaker would be welcome to stay for the remainder of the web-meeting or drop off after he/she is done.

2. September 20, 8:20 – 10:30 am EDT: Workshop, Regional Collaboration on Steps to Eliminate Lead from Drinking Water
   The speaker would be the first of four and would have 35 minutes for a presentation on the problem of lead in drinking water in schools and other facilities, including federal resources available to help address the problem. Five minutes will be available for Q&A afterward. It would be helpful if the speaker would stay for the entire session.

As we discussed, the audience will not have a strong background in science, so the presentation of scientific information should be done appropriately. Also, it would be helpful for the workshop speaker to share examples of best practices or innovative approaches that state legislators might consider adopting. My intention is to have a conference call with the speakers for each session to go over the plans and make sure everyone has the same understanding of the purpose, the audience, and the points to be covered by other speakers so that any duplication of material is done intentionally to reinforce concepts.

The agenda for the institute is attached. Please let me know if you need any other information to help with identifying the speakers. Thank you very much for your help, Jack.

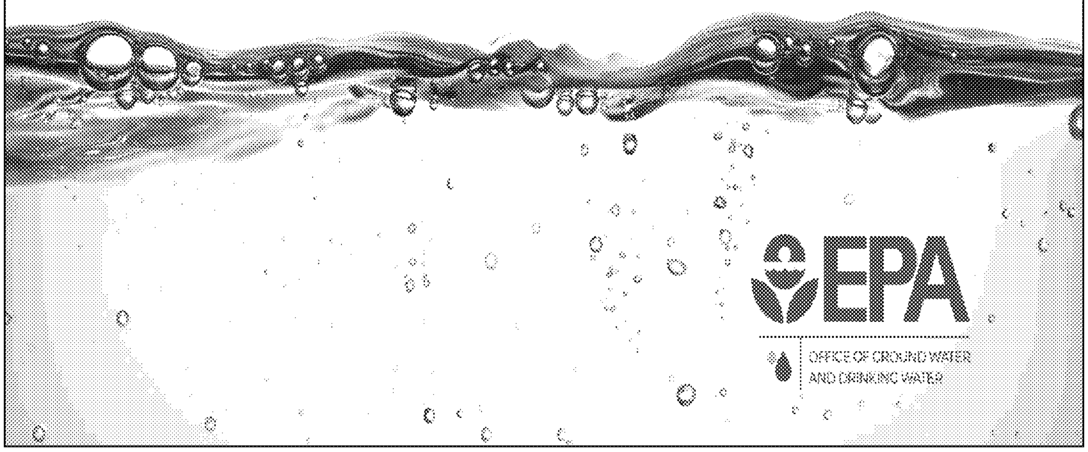
Best,
Lisa

Lisa R. Janairo

Program Director
The Council of State Governments
Midwestern Office
920.458.5910
ljanairo@csg.org

National Primary Drinking Water Regulation: Lead and Copper

Great Lakes Legislative Caucus
August 17, 2018



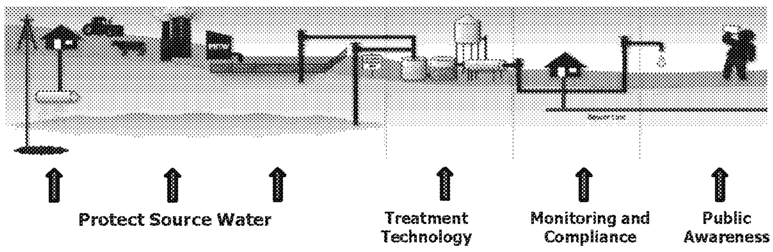
Agenda

Safe Drinking Water Act

Background on the Lead and Copper Rule (LCR)

Key areas for potential rule revisions

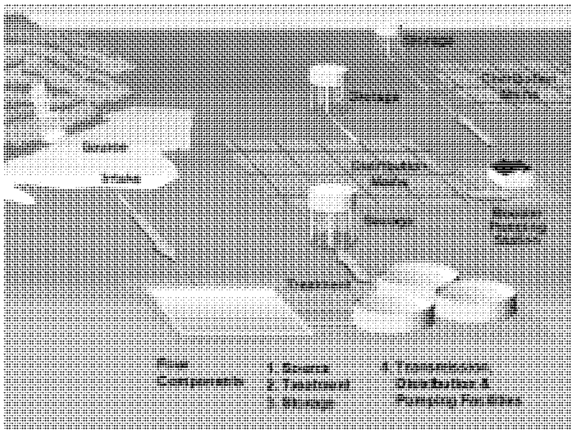
SDWA Framework: *Source to Tap*



Public Water Systems

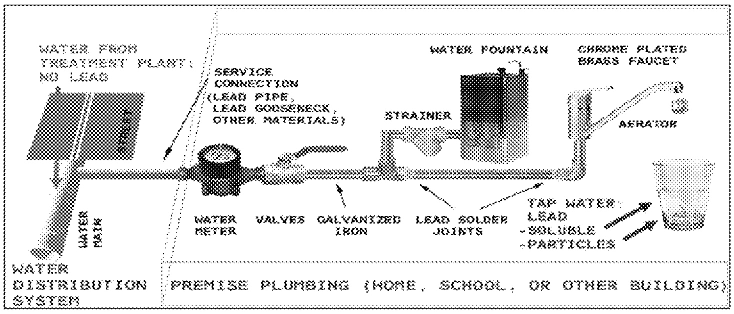
- EPA has authority to regulate public water systems under the Safe Drinking Water Act (SDWA)
  - A PWS is a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.
  - Types of PWS:
    - Community water system (CWS)
    - Non-transient noncommunity water system (NTNCWS)
    - Transient noncommunity water system (TNCWS)
- EPA does not have authority to regulate private wells

Characteristics of Public Water Systems



Lead and Copper Rule (LCR)

- The National Primary Drinking Water Regulation for Lead and Copper was promulgated June 7, 1991.
- Applies to 68,000 public water systems serving ~300 million people
- Lead and copper enter drinking water mainly from corrosion of lead and copper containing plumbing materials.
- The LCR requires water systems to sample taps and to take actions including treating water to make it less corrosive to plumbing materials that contain lead and copper, educating consumers and replacing lead service lines.



LCR: Health Effects

Lead:

- Lead damages the brain, red blood cells and kidneys
  - Studies consistently demonstrate the harmful effects of lead exposure on children, including cognitive function, decreased academic performance and poorer performance on tests of executive function.
  - Lead exposure is also associated with decreased attention, and increased impulsivity and hyperactivity in children.
  - Lead is particularly dangerous to children because their growing bodies absorb more lead than adults and their brains and nervous systems are more sensitive to the damaging effects of lead.

Copper:

- Can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson's disease in genetically predisposed people

Key Challenges with the Current LCR

- The LCR is one of the most complicated drinking water regulations for states and drinking water utilities to implement.
- The LCR is the only drinking water regulation that requires sampling in homes, often by the consumers themselves, with very specific sampling procedures that are not always followed.
- The current structure of the rule compels additional protective actions by water systems only after a potential problem has been identified; under the current rule, up to 10% of samples can have highly elevated levels of lead with no additional requirement for actions.
- Many systems have not fully optimized corrosion control treatment or have not maintained optimized treatment, and small systems are not required to optimize corrosion control unless more than 10% of samples exceed the action level.
- In most communities, lead service lines are partially or entirely privately owned and a number of homeowners or renters may be unwilling or unable to replace the portion of the line at their home.

Key Areas for Rule Revisions

Lead Service Line Replacement

Corrosion Control Treatment

Tap Sampling

Public Education and Transparency

Copper Requirements

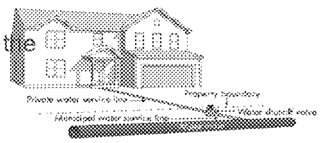
Lead Service Line Replacement

Current Requirements

- Systems that exceed the lead Action Level (AL) after installing corrosion control treatment (CCT) must replace 7% of lead service lines per year (the state can accelerate)
- Systems are only required to replace portion of the LSL owned by the PWS
- Systems may consider an LSL replaced if a sample from that line is below the AL
- Systems must offer to replace customer owned portion at customer cost
- LSLR can stop when lead <=AL for 2 consecutive monitoring periods

Challenges

- Most homeowners have declined the opportunity to replace their portion of the lead service line.
- Partial replacements may be harmful due to the disruption of the service line dislodging lead



Lead Service Line Replacement: Key Questions

What are the opportunities and challenges to state and local governments if EPA were to modify the LCR to:

- Require systems to create an inventory of lead service lines
- Require proactive full lead service line replacement on a specified schedule (e.g., 10, 15, 25, 35 years from promulgation)
- Allow partial LSLR only for emergency repair or "unwilling or unable customers" when conducting infrastructure replacement (e.g., main replacement)
- Require pitcher filters to be distributed and regularly maintained by the PWS for three months immediately following lead service replacement

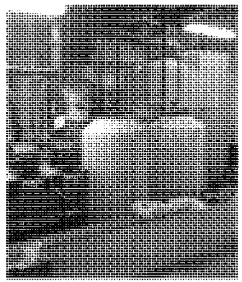
Corrosion Control Treatment

Current Requirements

- Systems serving >50,000 required to perform CCT
- Systems serving ≤50,000 required to perform CCT <u>if</u> AL exceeded
- System proposes treatment (or changes) and state approves

Challenges

- States and water systems often lack needed expertise
- Some small systems with lead service lines are not required to perform CCT



Corrosion Control Treatment
Key Questions

What are the opportunities and challenges to state and local governments if the LCR was modified to:

- Target systems to required install CCT differently:
  - Change the current system size threshold (50,000 people served), or
  - Require systems with lead service lines (regardless of population served) to install and maintain CCT?
- Require plumbed in point of use treatment devices to be provided to households with lead service lines and regularly maintained
- Change the requirements for designating optimal CCT to:
  - Prescribe a default CCT that must be maintained unless a system can demonstrate equivalent CCT to the state, or
  - Require the system to conduct a periodic re-evaluation of CCT to be reviewed by the state?
- Require system to find and fix problems in corrosion control treatment if a tap sample exceeds an action level?

Transparency & Public Education

Current Requirements

- The annual Consumer Confidence Report sent to all consumers must include lead sampling results and an informational statement about the health effects of lead and actions to reduce exposure
- Systems that exceed lead action level must begin public education within 60 days after end of monitoring period:
  - Educational materials must include information on health effects of lead, sources of lead, and steps consumers can take to reduce exposure to lead in drinking water
- The 2016 Water Infrastructure Improvement for the Nation Act (WIIN) requires notice of exceedance of AL within 24 hours

Challenges

- Intensive public education only occurs after a problem has been identified
- Information on lead in drinking water is confusing, particularly results in comparison to the action level

Transparency & Public Education: Key Questions

What do state and local governments think are the most effective ways for water systems to deliver educational information to consumers?

What opportunities and challenges would state and local governments face if the LCR was revised to require:

- Water systems to provide on-going targeted outreach with a special emphasis on all customers with lead service lines?
- Water systems to provide notification to consumers within 24 hours of exceeding an action level (as required by the 2016 WIIN Act)?
- Water Systems to make information accessible to consumers on results of all tap sampling, results of water quality parameter (WQP) monitoring and the number and locations of LSLs?

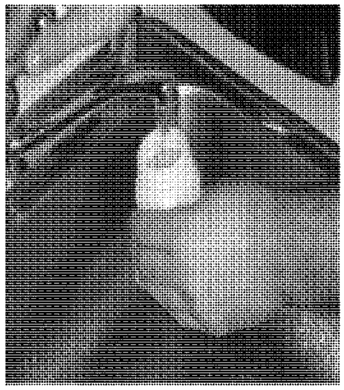
LCR Tap Sampling

Current Requirements

- Collect samples at residential taps that are at high risk of lead contamination
- 90^{th} Percentile result compared to Action Levels based on treatment feasibility
  - 15 ppb (µg/L) lead
  - 1.3 ppm (mg/L) copper

Challenges

- Complicated sampling procedure
- Procedures are not always followed
- Up to 10% of samples can have highly elevated levels of lead with no additional requirement for actions



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Tap Sampling
Key Questions

What are the opportunities and challenges for states and local governments if the rule changed sampling protocols, including:

- Changing where water systems are required to collect tap samples?
    - At sites based on customer request,
    - At schools served by the system,
- Change the way samples are collected to be more representative of exposure?
    - Increase the number of samples required
    - Instruct consumers to sample when they are drawing water for drinking or cooking.
- Establish a household action level that if exceeded would trigger a report to the consumer and to the applicable health agency for follow up?

Copper

Current Requirements

- Copper samples are collected at the same time and customer taps as lead samples.
- The 90^{th}% value of results is compared to the copper AL of 1.3 ug/L.
- If the copper AL is exceeded, water systems must implement CCT.

Copper Revisions
Key Questions

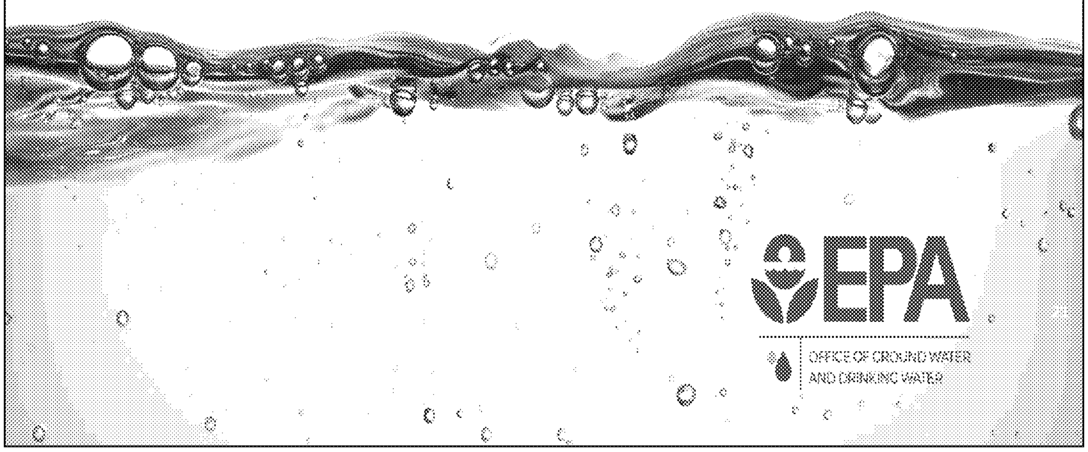
What opportunities and challenges would state and local governments face if EPA revised the LCR to:

- Establish a screen to determine if water systems have water aggressive to copper?
  - If water is aggressive, require:
    - monitoring and/or
    - public education and/or
    - CCT.
- Modify tap sampling to require separate sampling sites for copper?

Opportunity for Input

- EPA intends to propose revisions in 2019
- The proposal will be available for pubic review and comment
- EPA will carefully consider public comments in preparing final revisions to the LCR

QUESTIONS



Message

From: Niman, Paul (DEP) [paul.niman@state.ma.us]
Sent: 10/22/2014 12:37:44 PM
To: Helm, Erik [Helm.Erik@epa.gov]; 'jgrande@madisonwater.org' [jgrande@madisonwater.org]; 'wfm@lbwl.com' [wfm@lbwl.com]; Schock, Michael [Schock.Michael@epa.gov]; Shao, Nicole [Shao.Nicole@epa.gov]; Ellis, Jerry [Ellis.Jerry@epa.gov]; Kempic, Jeffrey [Kempic.Jeffrey@epa.gov]
CC: Robinson, Matt M. [Robinson.MattM@epa.gov]; Fultz, Christopher [Fultz.Christopher@epa.gov]; Osterhoudt, Darrell [dosterhoudt@asdwa.org]; Guterman, Damon (DEP) [damon.guterman@state.ma.us]
Subject: RE: NDWAC presentations and meeting time to practice
Attachments: NDWAC LCR Presentation on State Perspective on LSLR.pptx

I've already indicated that I am not available on the 27-28, but I am available on 29-31. Attached is the draft of my presentation, but I hope to add a few more slides providing perspectives on LSLR from other states.

Paul S. Niman
Department of Environmental Protection
Drinking Water Program
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Boston, MA 02108
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Fax: (617) 292-5696
Email: paul.niman@state.ma.us
DW Website: http://www.mass.gov/eea/agencies/massdep/water/drinking/
Board Website: http://www.mass.gov/ocabr/licensee/dpl-boards/dw

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From: Helm, Erik [mailto:Helm.Erik@epa.gov]
Sent: Tuesday, October 21, 2014 3:12 PM
To: Niman, Paul (DEP); 'jgrande@madisonwater.org'; 'wfm@lbwl.com'; Schock, Michael; Shao, Nicole; Ellis, Jerry; Kempic, Jeffrey
Cc: Robinson, Matt M.; Fultz, Christopher
Subject: NDWAC presentations and meeting time to practice

Hello,

Please don't forget rough drafts are due this Friday.

Also, we have to set up a time to have our one hour practice session going over our draft materials and learning the webinar software. Most of the EPA people involved are free from 9 am – 5 pm EST on Monday the 27th. They are also available from 9 am – 10 am and from 12 pm – 5 pm on Tuesday the 28th.

Please respond with your availability to meet on the 27th and 28th so I can schedule this one hour meeting.

Thanks very much,
Erik

Erik C. Helm, Ph.D.
Senior Economist
U.S. Environmental Protection Agency
OW, OGWDW, SRMD,
Targeting and Analysis Branch
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Mailcode 4607M
1200 Pennsylvania Avenue, N.W.

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E-mail: Helm.Erik@epa.gov
Ph: 202-566-1049
Fax: 202-564-3760

State Perspective on Lead Service Line Replacement

Paul S. Niman
Environmental Engineer
Massachusetts Department of Environmental Protection
ASDWA LCR Work Group
November 5, 2014

Current LSLR Triggers

- Systems that fail to meet the lead action level after installing corrosion control and/or source water treatment must replace lead service lines (LSLs) in accordance with an approved lead service line replacement (LSLR) plan.
- Systems that fail to meet the lead action level and are required to install corrosion control and/or source water treatment and fail to do so may be required to replace lead service lines.

Current LSLR Requirements

- The system must replace 7% of the initial number of LSLs in its distribution system, based on a materials evaluation and evaluation regarding the portion owned by the system.
- The system is not required to replace an individual LSL if the lead concentration in all service line samples from that line is less than or equal to 0.015 mg/L. (This is considered "testing out".)

Current LSLR Requirements (cont.)

- The system must replace the portion of the LSL that it owns.
  - If the system does not own the entire LSL, the system must replace the portion it owns and offer to replace the owner's portion.
  - The system is not required to bear the cost of replacing the owner's portion.

Current LSLR Requirements (cont.)

- The system may be required to replace LSLs on shorter schedule than 7% per year if feasible.
- The system may discontinue LSLR whenever first draw samples meet the lead action level during each of two consecutive monitoring periods.
- The system must reinstitute LSLR if the system exceeds lead action level in any monitoring period.

Current Partial LSLR Requirements

- At least 45 days prior to partial lead service line replacement (PLSLR), the system must provide notice to the residents served by the LSL explaining that they may experience a temporary increase in lead levels along with guidance consumers can use to minimize their exposure to lead.
- Within 72 hours after completion of PLSLR, the system must collect a sample for analysis of lead content.
- Within 3 business days of receiving results, the system must report the results to the owners and the residents.

State Issues

- LSLR vs. PLSLR
- Benefits of LSLR/PLSLR
- Control of LSLs
- Environmental Justice Concerns
- Improving Public Education
- Funding LSLR

LSLR vs. PLSLR

- Full Service Line Replacement
  - Typically owner requested.
  - Replaces entire service line from main to meter.
- Partial Service Line Replacement
  - Typically initiated by system (e.g. DPW project).
  - Owner may be unable or unwilling to pay cost for their portion of the service line.

Benefits of LSLR vs. PLSLR

- In 2011, the Science Advisory Board (SAB) examined the effectiveness of PLSLR in reducing lead drinking water exposures.
- Although data was limited, the SAB found LSLR appears to reliably achieve long-term reductions in drinking water lead levels.
- The SAB found that there is a potential for harm from PLSLR and no evidence of a benefit from PLSLR in the short term (e.g. within approximately one year).
- The long term benefit of PLSLR could not be determined.

Benefits of LSLR vs. PLSLR (cont.)

- SAB found the available information to suggest that PLSLR may pose a risk to the public, due to short-term exposure to elevated lead levels.
- SAB noted that the lack of data limited their ability to offer stronger conclusions and recommendations on PLSLR.
- EPA has suggested that States might want to limit PLSLR, but has taken no specific action to do so.

Control of LSLs

- Typically, the system owns the portion of the service line from the main to the property line (curb stop) and the owner owns the portion of the service line from the property line to the house/building.
- In some communities, the system has legislated ownership of the entire service line to the owner.
- The system is only responsible for replacing the portion of the LSL they own or control.

Control of LSLs (cont.)

- In communities in which the owner is responsible for the entire service line, the system has no responsibility to do LSLR.
- This provides the system with a mechanism to avoid LSLR and creates a burden for the owner.

Environmental Justice Concerns

- There are environmental justice concerns due to the fact that many of the communities have LSLs in the older areas where many minorities and lower income families reside.
- A mechanism needs to be developed to provide financial assistance to owners to encourage the replacement of LSLs in environmental justice areas.

Improving Public Education

- Owners and residents need to be more aware that their property is served by a LSL and its potential impact on their health.
- Owners and residents with LSLs need to regularly be provided with public education materials that provide guidance on the benefits of replacing their LSLs and steps that can be taken to minimize the exposure to lead.
- Systems should proactively encourage owners with LSLs to replace them.

Funding LSLR

- In order to encourage LSLR, funding mechanisms must be developed to encourage the replacement of LSLs.
- The State Revolving Fund (SRF) is one possible source of funding which could be made available to systems with a high number of LSLs.
- Betterments are another funding mechanism which could be used to allow owners to replace their LSLs and spread the payments over a 10-20 year period with no interest.

State Perspectives

- Massachusetts
  - PLSLR is not effective in reducing lead levels.
  - People on fixed incomes (e.g. elderly) and low income families are more likely to have a PLSLR.
  - It is difficult to obtain samples from PLSLR sites.
  - One community passed legislation making the owners responsible for their entire service line, thereby eliminating their control for LSLR.

Recommendations

- Get the lead out!
  - Eliminate PLSLR immediately.
  - Do not allow PLSLR to count towards 7% replacement requirement.
  - 7% LSLR replacement per year is not sufficient since it allows some LSLs to remain in place for up to 15 years.
  - Provide regulatory authority for owners to do full LSLR and charge owner for portion of service line they own.
  - Eliminate "test outs", but require all systems with LSLs or PLSLRs to annually test the drinking water entering the house or building and report the results to the owner and residents.

Recommendations (cont.)

- Improve public education.
  - Develop education materials to encourage full LSLR.
  - Require all systems with LSLs to maintain a current list and annually provide owners and residents with public education materials that provide guidance on the benefits of replacing their LSLs and steps that can be taken to minimize the exposure to lead.
- Provide funding sources and mechanisms to encourage full LSLR. Options could include:
  - SRF loan funds
  - Betterments
  - Private assistance

Recommendations (cont.)

- Make information about lead service lines a part of property transactions, similar to the requirements for lead paint. Options could include:
  - Require information about LSLs to be included in property sale documents.
  - Require owners with LSLs to record that they have a LSL on their property deed.

Questions?

- Contact Paul Niman at (617) 556-1166 or at paul.niman@state.ma.us

Message

From: ECOS [ecos@ecos.org]
Sent: 2/21/2020 4:15:30 PM
To: Forsgren, Lee [Forsgren.Lee@epa.gov]
Subject: U.S. EPA Proposes to Regulate PFAS in Drinking Water, Provide Flexibility on Coal Ash Liners

U.S. EPA Proposes to Regulate PFAS in Drinking Water, Provide Flexibility on Coal Ash Liners

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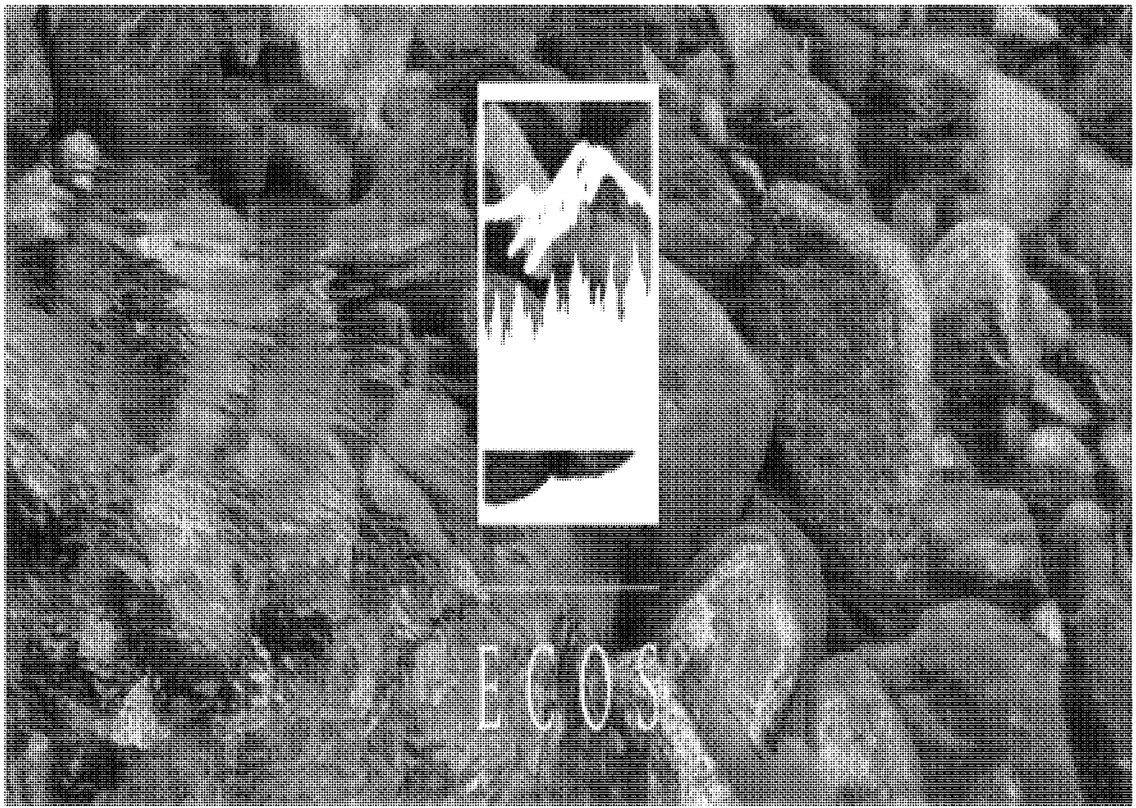

ECOSWIRE

Friday, February 21, 2020

Vol. 22 No. 7

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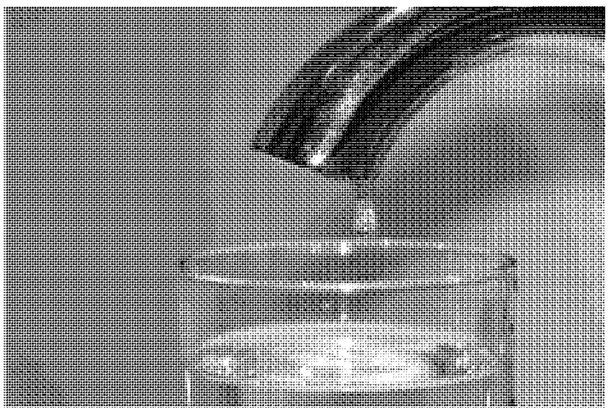
In Rare SDWA Step, U.S. EPA Proposes to Regulate PFOA and PFOS in Drinking Water



U.S. EPA yesterday announced its proposed decision to regulate PFOA and PFOS in drinking water. The long-awaited regulatory determination, as outlined in the agency's PFAS Action Plan, marks a rare move for setting standards for pollutants that meet Safe Drinking Water Act (SDWA) criteria. In early December, EPA sent its preliminary determinations to the Office of Management and Budget for interagency review.

The agency is also seeking public comment on eight contaminants to be listed on the fourth Contaminant Candidate List and is gathering information to determine if regulation is appropriate for other PFAS chemicals. Every five years, EPA must publish a list of contaminants (Contaminant Candidate List, CCL) that are known or anticipated to occur in public water systems and are not currently subject to drinking water regulations. Following public comment and CCL finalization, EPA determines whether or not to regulate these chemicals. According to *Inside EPA*, the proposed decision to regulate PFOA and PFOS is only the second time the agency has decided to regulate pollutants under the 1996-amended SDWA.

Additionally, the agency proposed regulations on imported products that contain certain persistent long-chain PFAS that are used in surface coatings, which can apply to items like furniture, household appliances, automobile parts, and electronics. The amended Toxic Substances Control Act provides EPA the authority to regulate products imported as a component of other products. Though the agency believes these materials are largely phased out from import, this clarification to the significant new use rule will ensure that the agency reviews any imported goods with PFAS used in surface coatings and provide EPA authority to restrict product imports if it finds potential unreasonable risks. EPA will accept public comments on this proposal for 45 days in docket EPA-HQ-OPPT-2013-0225 on www.regulations.gov. For more information, see here. [Longsworth]

U.S. EPA Provides Flexibility on Liners in Latest Coal Ash Proposal

On February 19, U.S. EPA announced additional proposed revisions and flexibilities to the regulations for the management of coal combustion residuals (CCR) – or coal ash – from electric utilities.

The proposal is the last in a set of four revisions to the 2015 rules that the agency is taking under the Trump Administration. EPA says the "common-sense changes" will provide the flexibilities owners and operators need to determine the most appropriate way to manage CCR and the closure of units based on site-specific conditions.

The latest proposal follows on the heels of others that implement the Water Infrastructure Improvements for the Nation Act, respond to petitions, address litigation, and aim to promote smooth implementation of the rule. It proposes four main changes:

- Procedures to allow a limited number of facilities to demonstrate to EPA that, based on groundwater data and the design of a particular surface impoundment, the unit has the equivalent protection from impacts on groundwater as provided by the composite liner system standards.
- A modification to closure requirements for units that are unable to complete groundwater remediation by the time all other closure by removal activities have been completed. Under this new provision, groundwater remediation must continue until groundwater protection standards are achieved during a post-closure period.
- An amendment to the notification of intent to close requirement designed to increase transparency.
- Conditions under which coal ash can be used in the closure of landfills and surface impoundments.

EPA will accept public comment on the proposal during a 45-day period, during which a public hearing will be held. For more information, see here. [Parisien]

U.S. EPA Issues Guidance on NSR Plantwide Applicability Limitation Provisions

U.S. EPA has released draft guidance on Plantwide Applicability Limitation (PAL) Provisions Under the New Source Review (NSR) Regulations. PAL permits set plantwide emissions limits for regulated pollutants under the NSR program, providing flexibility by allowing operators in some cases to avoid having to determine whether upgrades or other projects require an NSR permit related to an expected increase in emissions. The draft guidance addresses various elements of the program in order to respond to concerns and improve understanding.

Comments are due **March 16**. [Poole]

ECOS Calls for State Environmental Agency Budget Information

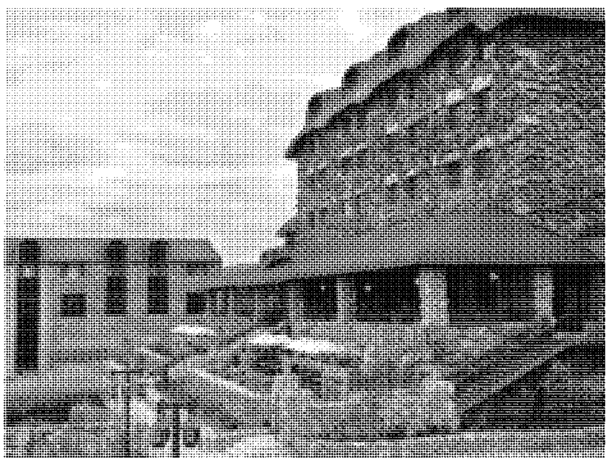
On February 19, ECOS issued surveys requesting states' assistance in updating information on environmental agency budgets for FY16-19. This work builds on an ECOS budget request in July 2016 for similar information (see ECOS *Green Report* entitled *Status of State Environmental Agency Budgets 2013-2015*). ECOS is seeking to update this information to reflect fiscal year budgets since 2015.

The budget information from this request will be used to reevaluate trends in the amount and composition of state environmental agency budgets. These findings will shed light on the importance of federal funding support and assist ECOS in identifying key future areas of concern to states.

ECOS also published similar green reports in 2012 for FY11-13 and in 2010 for FY09-11.

Please submit information by **March 11** to Beth Graves and Andrew Pratt of ECOS. Thank you to the states (Kansas, Louisiana, New Hampshire, and Oklahoma) that have already returned their completed surveys! [Graves/Pratt]

Make Your Spring Meeting Reservation by February 28 at the Omni Grove Park Inn



Have you saved your spot in Asheville, North Carolina for the ECOS Spring Meeting on *2020 Vision for the Environment*?

If not, make your hotel reservation at the Omni Grove Park Inn before the special group rate expires **February 28 (or sooner in the event of sellout)**. Also, register for the meeting at the regular rate by **March 13**.

Don't miss this chance to hear compelling keynotes from:

- North Carolina Department of Environmental Quality Secretary **Michael Regan** on his state's vision for a sustainable future;
- *New York Times* bestselling author **Seth M. Siegel** on fixing the nation's drinking water; and
- World Resources Institute Senior Fellow **Karl Hausker** on the transition to clean energy.

Rounding out the program are sessions spotlighting challenges and successes on everything from PFAS to plastics. You can also take part in virtual reality demonstrations and a celebration of Earth Day's 50th anniversary.

See the draft agenda and other meeting information here. For agenda and sponsorship information, contact Lia Parisien. For registration information, contact Paulina Lopez-Santos. For hotel information, contact Layne Piper. [Parisien]

State News You Can Use

Attention, New York Shoppers: BYOB (Bring Your Own Bag!)

California Tells EJ Story with New Visual Tool

When Bourbon Leaves the Barrel: Kentucky Reflects on Major Spill Response

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Need-to-Know News in Chemicals and Emerging Contaminants, Air, & Water

U.S. EPA Finalizes Low-Priority Chemical List under TSCA

Area of Focus: *Chemicals and Emerging Contaminants*

U.S. EPA this week published its list of 20 chemical substances identified as low-priority for risk evaluations under the amended Toxic Substances Control Act (TSCA). This action marks the completion of another TSCA requirement and helps the agency narrow down its long list of chemicals in order to focus its risk evaluation efforts on those that could significantly impact public health and the environment.

EPA designated 20 chemicals as high-priority under TSCA in December, and those chemicals are currently undergoing risk evaluation. See more here. [Longsworth]

2019 Power Plant Emission Data Show Drop in Key Emissions

Area of Focus: *Air*

U.S. EPA has released preliminary data on 2019 emissions of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon dioxide (CO_2), and mercury (Hg) from power plants in the lower 48 states. These data show a decline in overall emissions of these pollutants compared to 2018.

The annual data point to a 14% decline in NOx emissions compared to 2018, a 23% decline in SO_2 emissions, an 8% decline in CO_2 emissions, and a 13% decrease in Hg emissions. In addition, ozone season NOx emissions reportedly dropped 13%. During this time period, electric generation from these power plants decreased by 3%.

EPA notes that annual emissions of SO_2 from the power sector are below 1 million tons for the first time in modern history.

While there has been a 13% drop in Hg emissions, the White House Office of Information and Regulatory Affairs is still considering EPA's proposal to revoke its 2012 determination that it was "appropriate and necessary" to curb releases of mercury, arsenic, and other hazardous air pollutants from coal- and oil-fired power plants. [Poole]

U.S. EPA Produces Video Series on Low-Cost Air Quality Sensors

Area of Focus: *Air*

U.S. EPA has developed an air sensors educational video series, both in English and Spanish. The videos can be used to learn how EPA collects and uses air quality data, how air quality health risks are communicated, and how to interpret data collected using air sensors.

Many people look for credible air quality information to help reduce the risk from air pollution and to protect public health in their communities. Air sensors are usually lower in cost, portable, and generally easier to operate than the regulatory-grade air pollution monitors used in the United States to understand air quality conditions.

With increased availability of air sensors, thousands are now in use by individuals, community groups, health organizations, and others. The popularity of these devices, however, has resulted in many questions about how to use and communicate the sensor data collected during monitoring. The videos offer information to address common questions about these devices. [Poole]

U.S. EPA Announces Funding to Further Reduce Lead in Drinking Water

Area of Focus: *Water*

This week, U.S. EPA announced the availability of approximately $40 million to assist disadvantaged communities and schools with removing sources of lead in drinking water. The funding, authorized under the Water Infrastructure Improvements for the Nation (WIIN) Act, will be directed to schools and disadvantaged communities and will help support public health and economic potential.

More than $17 million is available for projects that implement or improve corrosion control or conduct lead service line replacements in disadvantaged communities, and $22.8 million is available for projects that remove sources of lead in drinking water (e.g., fixtures, fountains, outlets and plumbing materials) in schools or child care facilities.

EPA is prioritizing projects for drinking water systems that service disadvantaged communities, including those that are part of qualified Opportunity Zones, and that have exceeded the lead action level during the last three years.

This WIIN grant will be competed through a Request for Application process. The funding opportunity will remain open for 60 days on www.grants.gov. Learn more about this grant and EPA's other WIIN grant programs here. [Piper]

Upcoming Events

U.S. EPA on Small Drinking Water Systems Risk Assessment

As part of a monthly series on challenges and treatment solutions for small drinking water and wastewater systems, U.S. EPA is hosting a webinar on Drinking Water Tools for Small Systems on **February 25 at 2-3 p.m. Eastern**.

Please register here. [Piper]

ASDWA on Lead & Copper Rule Revisions Comment Review

The Association of State Drinking Water Administrators (ASDWA) will hold a states-only webinar on **February 27 at 12-1 p.m. Eastern** to review U.S. EPA's proposed Lead & Copper Rule Revisions (LCRR). The revisions, proposed November 13, ultimately will be a significant update of the 1991 Lead and Copper Rule (LCR) that will affect implementation for all states and territories.

This webinar will help states and territories better understand the proposed revisions and the potential ramifications to drinking water programs. Through the ASDWA LCRR Workgroup and the ASDWA Board, extensive comments were developed on the proposed LCRR.

The webinar will summarize the proposed LCRR, as well as ASDWA'S comments on the proposal. ECOS comments on the proposed revisions are available here.

Register here. [Piper]

ITRC on Issues and Options in Human Health Risk Assessment

ITRC will hold an online training course on *Issues and Options in Human Health Risk Assessment* on **February 27 at 1-3:15 p.m. Eastern.**

Regulatory project managers and decision-makers may not have specific guidance when alternative approaches, scenarios, and parameters are proposed for site-specific risk assessments, and are faced with difficult technical issues when evaluating these site-specific risk assessments. This training course and associated guidance document are resources for evaluating alternatives.

Register here. [Olonoff]

U.S. EPA on Disaster Debris

U.S. EPA will host a webinar on **March 5 at 1-2 p.m. Eastern** to explore lessons learned from two innovative projects following Hurricanes Katrina and Irene. Both projects aimed to ensure more resilient futures through disaster debris reduction, job creation, and community reconstruction. The webinar will highlight pre-disaster and resilience planning strategies as well as recovery efforts.

Register here. [Longsworth]

ITRC on Groundwater Statistics for Environmental Project Managers

ITRC will hold an online training course on *Groundwater Statistics for Environmental Project Managers* on **March 5 at 1-3:15 p.m. Eastern**.

Statistical techniques may be used throughout the process of cleaning up contaminated groundwater, but it can be challenging for practitioners who are not experts in statistics to interpret and use statistical techniques. The training class will encourage and support project managers and others who are not statisticians to: use the ITRC guidance document on *Groundwater Statistics and Monitoring Compliance* to make better decisions for projects; apply key aspects of the statistical approach to groundwater data; and answer common questions on background, compliance, trend analysis, and monitoring optimization.

Register here. [Olonoff]

Visit ECOS.org

Our mailing address is:
Environmental Council of the States
1250 H St NW Ste 850
Washington, DC 20005-3951

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Appointment

From: Best-Wong, Benita [Best-Wong.Benita@epa.gov]
Sent: 11/8/2018 9:57:47 PM
To: Best-Wong, Benita [Best-Wong.Benita@epa.gov]; Forsgren, Lee [Forsgren.Lee@epa.gov]; Giddings, Daniel [giddings.daniel@epa.gov]; Vazquez, Sharon [Vazquez.Sharon@epa.gov]; Gollan, Christopher [Gollan.Christopher@epa.gov]; chanson@ecos.org; Layne Piper [lpiper@ecos.org]; Sean Rolland [srolland@acwa-us.org]; Julia Anastasio [janastasio@acwa-us.org]; aroberson@asdwa.org; mpaque@gwpc.org; Marla Stelk [marla@aswm.org]; Grevatt, Peter [Grevatt.Peter@epa.gov]; Sawyers, Andrew [Sawyers.Andrew@epa.gov]; Nagle, Deborah [Nagle.Deborah@epa.gov]; Lape, Jeff [lape.jeff@epa.gov]; Goodin, John [Goodin.John@epa.gov]; Connors, Sandra [Connors.Sandra@epa.gov]; Mclain, Jennifer [Mclain.Jennifer@epa.gov]; Shimkin, Martha [Shimkin.Martha@epa.gov]; Moore, Kristie [Moore.Kristie@epa.gov]; Cummings, Travis [Cummings.Travis@epa.gov]; Bissonette, Eric [Bissonette.Eric@epa.gov]; Nelson, Tomeka [Nelson.Tomeka@epa.gov]; Chancey, Barbara [Chancey.Barbara@epa.gov]; Gilbertson, Sue [gilbertson.sue@epa.gov]; Ortiz, Agnes [Ortiz.Agnes@epa.gov]; Stebe, Katherine [Stebe.Katherine@epa.gov]; Bankester, Lenny [Bankester.Lenny@epa.gov]; Stabenfeldt, Lynn [Stabenfeldt.Lynn@epa.gov]; Kuntz, Kerry [Kuntz.Kerry@epa.gov]; Drummond, Laura [Drummond.Laura@epa.gov]; King, RyanM [King.RyanM@epa.gov]; Farber, Kit [Farber.Kit@epa.gov]; Clark, Jackie [Clark.Jackie@epa.gov]; Spraul, Greg [Spraul.Greg@epa.gov]
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Subject: DO NOT MOVE: Early Engagement on FY 2020/21 NPM Guidance with States
Attachments: Core Measure Metric Details.pdf; Core_Measures_32.pdf; Early engagement call states final agenda 2018.docx
Location: 3233 WJCE

Start: 12/10/2018 8:30:00 PM
End: 12/10/2018 9:30:00 PM
Show Time As: Busy

Metric Details Tab

Document metric details using this worksheet. Add lines as needed.

Metric ID	Strategic Measure	Performance Metric Title	Metric Definition	Algorithm	Data Source	Update Frequency
Breakthrough Metrics						
B01	-	Community Water Systems out of compliance with Health Based Standards (count)	Count of systems that have a health-based violations of the National Primary Drinking Water Standard.	The count of systems that have a health-based violation of the National Primary Drinking Water Standards. JOP represents number from Strategic Plan. Note - recalculated baseline after Strategic Plan was released is 3,508	Safe Drinking Water Information System (SDWIS) Federal (Fed) Data Warehouse. The SDWIS Fed Data Warehouse contains compliance information about public water systems and their violations of the NPDWRs as reported to EPA by the primacy agencies.	Quarterly
B02	-	Number of non-federal dollars leveraged by EPA water infrastructure finance programs (CWSRF, DWSRF and WIFIA).	Dollars of non-federal funds leveraged by the federal EPA investment in water infrastructure projects. Non-federal funds include loans made from recycled loan repayments, bond proceeds, state match, and interest earnings. The CWSRF Benefits Reporting System and DWSRF Project Reporting System are the sources of SRF data. States report project level data to these data systems on a quarterly basis. WIFIA results will be reported as loans close. Leveraging of non-federal dollars will be estimated based on financial details at loan closing.	Total dollar amount of non-federal funds invested in CWSRF, DWSRF and WIFIA water infrastructure projects. JOP is the expected annual number from the Strategic Plan.	SRFs: CWSRF Benefits Reporting Systam and DWSRF Project Reporting System WIFIA: HQ WIFIA loan agreements	SRFs: Quarterly WIFIA: monthly
B03	-	Watersheds with surface waters not meeting standards (square miles)	Begins in 2019. Begins with all impaired waters as of October 2018. Ends when waters are removed from the impaired waters list. Unit of measure: Square miles	Sum of square miles not meeting standards. JOP reflects the baseline from the Strategic Plan. Will be updated when we begin reporting in January 2019.	ATTAINS	Monthly beginning in 2019.
Operational / Sustainment Metrics						
S01.1	-	B01 SUBMEASURE - Systems Out of Compliance Due to Lead	The LCR is a treatment technique rule, which requires water systems to conduct tap sampling for lead to	The count of systems that have a violation of the Lead and Copper Rule. JOP represents the data from the starting	Safe Drinking Water Information System	Quarterly
S01.2	-	B01 SUBMEASURE - Strengthen the technical, managerial and financial capacity of drinking water systems	Strengthening public drinking water system long-term sustainability and public health protection. The count of engagements with states and water utilities (number of events) including Capacity Development Activities, Reducing Lead in Drinking Water in Schools and Child Care Facilities Events, Region/State Meetings, Asset Management Events, Area-wide Optimization Field Events, Water System Partnership Activities, Lead & Copper Rule - Action Level Exceedance training events, and technical rule compliance assistance events.	Strengthening public drinking water system long-term sustainability and public health protection. The count of engagements with states and water utilities (number of events) including Capacity Development Activities, Reducing Lead in Drinking Water in Schools and Child Care Facilities Events, Region/State Meetings, Area-wide Optimization Field Events, Water System Partnership Activities, Lead & Copper Rule - Action Level Exceedance training events, and technical rule compliance assistance events.	Regions and HQ Monthly inventory of activities	Monthly
S01.3	-	B01 SUBMEASURE - Number of Community Water Systems out of compliance with Health Based Standards in Indian country	Count of systems that have a health-based violations of the National Primary Drinking Water Standard in Indian Country.	The count of systems in Indian Country that have a health-based violation of the National Primary Drinking Water Standards.	Safe Drinking Water Information System (SDWIS) Federal (Fed) Data Warehouse. The SDWIS Fed Data Warehouse contains compliance information about public water systems and their violations of the NPDWRs as reported to EPA by the primacy agencies.	Monthly
S02.1	-	B02 SURROGATE MEASURE Engagements with the water infrastructure community (count)	Count of the number of engagements with the water infrastructure community compasses a wide range of activities across a number of programs and includes meetings, conferences, workshops, information sessions, finance forums, etc.	Count of engagements JOP represents the data from the starting point.	Headquarters	Monthly
S02.2	-	B02 SURROGATE MEASURE Water infrastructure financing tools, training, and resources provided (count)	Count of the number of tools, training and resources provided that promote innovative financing strategies to federal, state and local stakeholders.	Count of tools, training, and resources provided. JOP represents the data from the starting point.	Headquarters	Monthly
S03.1	-	B03 SURROGATE MEASURE - Electronic submission of state Integrated Reports	Begins with states and territories submitting their Integrated Reports. Ends when all 2016 or 2018 Integrated Reports are submitted electronically into ATTAINS to establish a most current baseline for the breakthrough measure 3.0. Unit of measure: Integrated Reports	Count of electronic Integrated Reports submitted by states into ATTAINS. JOP represents the data from the starting point.	ATTAINS	Monthly beginning with April 2018 data.
S03.2	-	B03 SURROGATE MEASURE: Outstanding State submission of 303(d) lists	Begins with states and territories submitting their Integrated Reports. Ends when all 2016 or 2018 Integrated Reports are submitted electronically into ATTAINS to establish a most current baseline for the breakthrough measure 3.0. Unit of measure: Integrated Reports	Count of outstanding state 303(d) lists due to be submitted to EPA. JOP represents the number of outstanding lists in April 2018. Lists are due April 1 of every even year. The JOP represents when we began reporting on this measure. It includes outstanding 303(d) lists from 2016 or prior cycles and lists that were due on April 1, 2018.	ATTAINS	Monthly beginning with April 2018 data.

Metric ID	Strategic Measure	Performance Metric Title	Metric Definition	Algorithm	Data Source	Update Frequency
S03.3		B03 SUBMEASURE: Watersheds with surface waters not meeting standards because of nutrients (square miles)	Begins in January 2019. Begins with all impaired waters for nutrients as of October 2018. Ends when those waters are removed from the impaired waters list. Unit of measure: Square miles	Sum of square miles for waters impaired by nutrients now meeting standards. The following parameters are used in ATTAINS to flag waters impaired by nutrients (which includes nitrate, nitrogen, phosphorous, etc) , and nutrient-related parameters including: algal growth, noxious aquatic plants, and organic enrichment/oxygen depletion. JOP will be calculated when we begin reporting in January 2019.	ATTAINS	Monthly beginning in 2019.
S04	-	Drinking Water Sanitary Surveys (Percent)	**REQUIRES REGIONAL TARGET NEGOTIATION** - Percent of Community Water Systems that have undergone a sanitary survey within the past 3 years (five years for outstanding performers or those ground water systems approved by the primacy agency to provide 4-log treatment of viruses) - Note: The percent calculation is determined on an annual calendar. The 1/3 required # of annual surveys re-sets each January. By December the percent of surveys completed should be in the 90s increasing annually towards the 2022 goal of 98%. Presumes approximately 1/3 of 3-year total of sanitary surveys are conducted each year. Total percentage re-sets to ~60% each January. 2018 3-yr target =92%, 2019=93%, 2020=94%, 2021=96%, 2022=98%	Percent of Community Water Systems that have undergone a sanitary survey within the past 3 years (five years for outstanding performers or those ground water systems approved by the primacy agency to provide 4-log treatment of viruses). JOP represents the data from the starting point.	Safe Drinking Water Information System (SDWIS) Federal (Fed) Data Warehouse. The SDWIS Fed Data Warehouse contains compliance information about public water systems and their violations of the NPDWRs as reported to EPA by the primacy agencies.	Quarterly
S05	-	Reviews of State DWSRF (count)	Count of Reviews from Oct. 1 to Current Reporting Month	Count of Reviews. JOP represents the data from the starting point.	Regional & HQ reporting	Monthly
S06	-	State PWSS rule primacy applications in backlog	**REQUIRES REGIONAL TARGET NEGOTIATION** - Number of state drinking water rule primacy packages processed that had been awaiting approval. Backlog primacy packages are defined as those awaiting Agency approval for the last five recently promulgated regulations- RTCR, GWR, Stage 2, LT2 and short term revisions to LCR.	Number of state drinking water rule primacy packages processed that had been awaiting approval. Backlog primacy packages are defined as those awaiting Agency approval for the last five recently promulgated regulations- RTCR, GWR, Stage 2, LT2 and short term revisions to LCR.	Regional & HQ reporting	Monthly
S07	-	Class I, II, III, V, VI UIC Well Permits in Backlog (number)	Pending permit applications older than 6 months	Sum of the number of new permit applications (i.e., those that have not yet been issued or denied) received more than 180 calendar days from the last day of the previous month (e.g., February 28 for the March bowling chart). The clock starts with the initial submittal of an application, not submittal of a full and complete application. Does not include those permits that have been issued.		
S08		Percent of community water systems where risk to public health is minimized through source water protection.	**REQUIRES REGIONAL TARGET NEGOTIATION** - criteria definitions used by states must be normalized. Historically reported annually. Assessing whether quarterly reporting is feasible.	TBD	Regions	
S09	-	Reviews of State CWSRF (count)	Count of Reviews - during state reviews, EPA Headquarters and the Regions promote national priorities with the state-run programs, including increasing the non-federal dollars leveraged by EPA federal investment in water infrastructure programs.	Count of Reviews. JOP represents the data from the starting point.	Regional & HQ reporting	Monthly
S10	-	Administratively continued (backlogged) non-Tribal EPA-issued individual NPDES permit backlog	A total count of all non-Tribal administratively-continued permits issued by EPA as of the end of the month prior to the reporting month.	Cumulative Count of administratively continued non-Tribal individual NPDES Permits. Permits included have passed their expiration date, and are either awaiting reissuance or have been issued but the reissued permit is not yet effective.	ICIS-NPDES	Monthly
S10.1		Administratively continued (backlogged) Tribal EPA-issued individual NPDES permit backlog	A total count of all Tribal administratively-continued permits issued by EPA as of the end of the month prior to the reporting month.	Cumulative Count of administratively continued Tribal individual NPDES Permits. Permits included have passed their expiration date, and are either awaiting reissuance or have been issued but the reissued permit is not yet effective.	ICIS-NPDES	Monthly
S11	-	New NPDES non-Tribal individual permit backlog	Pending permit applications older than 6 months	Sum of the number of new permit applications (i.e., those for facilities that do not already have coverage for their discharge) received more than 180 calendar days from the last day of the previous month (e.g., February 28 for the March bowling chart). The clock starts with the initial submittal of an application, not submittal of a full and complete application. Includes applications that have been issued but are not yet effective.	ICIS-NPDES	Monthly
S11.1	-	New NPDES Tribal individual permit backlog	Pending permit applications older than 6 months	Sum of the number of new permit applications (i.e., those for facilities that do not already have coverage for their discharge) received more than 180 calendar days from the last day of the previous month (e.g., February 28 for the March bowling chart). The clock starts with the initial submittal of an application, not submittal of a full and complete application. Includes applications that have been issued but are not yet effective.	ICIS-NPDES	Monthly

Metric ID	Strategic Measure	Performance Metric Title	Metric Definition	Algorithm	Data Source	Update Frequency
S12	-	Average process time for requests for coverage under NPDES general permits	Average number of days to process NOIs	Days from the initial NOI received date to the effective date for all NOIs under EPA-issued NPDES General Permits that became effective in the reporting month	ICIS-NPDES	Monthly
S13	-	Water Quality Standards actions in backlog	The number of state and tribal Water Quality Standards (WQS) revision actions that have been submitted to EPA since May 2000 that EPA neither approved nor disapproved within the first 60 days after submittal to EPA, and that have yet to be so acted upon. The Clean Water Act requires EPA to review state and tribal WQS revisions and either approve within 60 days or disapprove within 90 days.	Number of WQS submission actions	Regional files of required state and tribal WQS submissions to EPA; WQS Action Tracking Application (WATA)	Monthly
S14		Number of States completing triennial reviews on time	Number of states that have completed the two key elements of a triennial review in the past 36 months. "States" are the 50 states and 6 U.S. territories. "Key element" #1: Conducting at least one public hearing to review all Clean Water Act Water Quality Standard applying to state waters. "Key element" #2: Adopting -- or providing an explanation for not adopting -- revised water quality criteria for each parameter for which EPA has published updated recommendations for national water quality criteria.	Number of States. JOP represents the data from the starting point.	Regional files of required state submissions to EPA	Monthly
S15		Number of States and Territories with a methodology for notifying the public when a harmful algal bloom is present	Number of States and Territories with a method for notifying the public when there is an algal bloom of any kind. States have different mechanisms for letting their citizens know. NOTE: Water managers are usually the first responders to algal blooms in surface water systems. Managers should have a system in place to make information on HABs occurrences and possible public health risks available to the public in a timely manner.	Counting number of States and Territories with methods. NOTE: "Methods" include: - monitoring for algal blooms (cyanobacteria cells and/or toxins, use of remote satellite data, reporting forms and links in State websites for public reporting) - responding (guideline values in place, Cyanobacterial Management/Response Plans in place, post advisories and closures) - risk communication (emails, press notifications, maps, websites, social media, and outreach materials like fact sheets, signs, pictures of blooms, etc.)	Monthly Reports from States and Tribes that are publicly available through the internet.	Monthly
S16	-	Progress in putting priority TMDLs, alternative restoration plans and protection approaches in place	This measure looks at the extent of priority area activities leading to a completed TMDL, or alternative restoration approach or protection approach agreed to by EPA. It begins when states submit their Integrated Report and ends once a TMDL, alternative restoration approach or protection approach is in place. Unit: percent. Jop and monthly targets are draft and will likely be adjusted once we calculate those states that have received partial credit for getting plans in place.	Percent of priority waters that have a completed TMDL, alternative restoration plan or protection approach agreed to by EPA. The EPA provides 0.5 credit for priority plans under development and full credit when a plan is approved/accepted. (algorithm: [(priority waters w/ TMDL/Plan in place * 1) + (priority waters w/ TMDL/plan started *0.5) + (Priority waters with no TMDL/Plan started/in place*0)]/(total priority waters) Goal is to have 100% of priority waters to have a TMDL, alternative restoration plan or protection approach in place by 2022. Database transition- JOP is priority waters that have a TMDL, alternative restoration plan or protection approach in place at the time of our first calculation (in April).	ATTAINS	Monthly
S17	-	Backlog of EPA action on TMDLs	Begins when a state submits a TMDL for EPA action and EPA has not taken action within 30 days. Ends once EPA has acted on the TMDL. Unit: backlog of TMDLs that have taken EPA more than 30 days to take action. JOP is draft.	Count of the number of TMDLs that have been submitted to EPA where EPA has taken longer than 30 days to take action. In FY 2017 the EPA took action on 3,348 TMDLs.	ATTAINS	Monthly
S17.1	-	S19 SUBMEASURE - Backlog of EPA action on priority TMDLs	Begins when a state submits a TMDL in one of their priority waters for EPA approval and EPA has not taken action within 30 days. Ends once EPA has acted on the TMDL. Unit: Backlog of TMDLs that have taken EPA more than 30 days to take action. JOP is draft.	Count of the number of TMDLs in vision priority waters that have been submitted to EPA where EPA has taken longer than 30 days to take action. In FY 2017 the EPA took action on 3,348 TMDLs.	ATTAINS	Monthly
S18	-	Backlog of EPA action on 303(d) Lists	Begins when a state submits a 303(d) list for EPA approval and EPA has not taken action within 30 days. Ends once EPA has acted on the list. Unit: Backlog of lists that have taken EPA more than 30 days to take action. JOP is draft.	Count of the number of 303(d) lists that have been submitted to EPA where EPA has taken longer than 30 days to take action.	ATTAINS	Monthly

Metric ID	Strategic Measure	Performance Metric Title	Metric Definition	Algorithm	Data Source	Update Frequency
S19		Number of primarily nonpoint source-impaired waterbodies partially or fully restored by NPS program actions.	This measure tracks the number of water quality impairments removed from NPS-impaired waterbodies through NPS program restoration work. An impairment cannot be counted simply through a state 303(d) de-listing action; specific management activities must have been taken within the watershed to demonstrably improve the waterbody. For example, if a water was inappropriately assessed/listed for pathogens, correction of this error does not satisfy requirements to be counted in this measure. However, if a waterbody impaired for pathogens is restored through NPS restoration work eliminating the source and the waterbody/pollutant is subsequently removed from the 303(d) list, this would qualify for the measure.	Sum of distinct water quality impairments removed from each NPS-impaired waterbody. This measure is cumulative, growing over time. The majority of submissions occur in the final quarter of the FY. In this measure, and impairment is a pollutant or stressor preventing a water from meeting the water quality standard/criteria adopted by states to protect designated uses. A qualifying de-listing in one where: 1) the waterbody now either fully supports the use or meets the water quality criterion for which it had been impaired, and 2) the cause of impairment can be removed from the state's Section 303(d) list.	GRTS	Monthly
S20	-	Report on the Quality of the nation's waters.	This measure tracks the progress of implementing a national survey that supports reporting on the quality of the Nation's waters. Progress will be based on the lab analysis and will track the number of samples analyzed.	Percentage based on sum of the number of sample results delivered to EPA divided by the total number collected. This measure will be updated monthly to track progress toward quarterly milestones in lab contracts.	Monthly progress reports verified by EPA TOCORs	Monthly
S21	-	**Placeholder:** UIC Permit Renewal Measure	TBD	TBD	TBD	TBD
Agency-wide Metrics						
A01	-	On-Boards/FTEs	Actual FTE (FTE-HR Roster Minus Average Reimbursable FTE Excluding FEMA) at the time OCFO runs the FTE report.	Actual On-Boards/FTEs = FTE-HR Roster (On-Board adjusted for part-time) minus Average Reimbursable FTE Excluding FEMA. Target On-Boards/FTEs = FY 2018 Interim FTE Target - Appropriated. This does not include new hires not yet on board. EPA plans to achieve these targets through normal attrition.	Monthly report provided by OCFO.	Monthly
A02	-	Pending new hires older than 90 days	Number of pending hires in excess of 90 days old. The clock starts upon the receipt of the request by Workforce Transformation and Tracking System (WTTS) and remains pending until the final job offer is made. This metric applies to both internal and external hires.	Elapsed Calendar Days = current date minus the date of receipt of the request by WTTS. Pending Hires Older than 90 days = sum of the number of pending hires with elapsed calendar days in excess of 90. The hire remains pending until a final job offer is made.	Monthly report provided by OARM.	Monthly
A03	-	Employee ideas implemented	Number of employee ideas that result in a change in operations. Documentation must include at a minimum the name of the employee, the means by which the idea was suggested, the nature of the change, the actual improvement resulting from the change, and the date implemented.	Sum of the number of employee ideas that resulted in demonstrable operational change.	TBD. For now, programs and regional offices develop means of soliciting employee ideas, evaluating them, implementing if appropriate, and tracking results for this measure.	Monthly
A04	SM-24	Pending acquisitions in excess of PALT	Procurement Action Lead Time (PALT) is the number of calendar days allowed for each type of procurement process. Until a mechanism is developed to capture the acquisition planning phase of PALT, this metric will capture the days to process procurement actions from the time OAM/Regional Contracting Office receives the procurement package to the time of contract award.	Elapsed Calendar Days = current date minus the date OAM received the procurement package. Pending Acquisitions in excess of PALT = sum of all pending acquisitions. Acquisitions remain pending until the award is made.	Monthly report provided by OARM.	Monthly
A05	-	State and tribal request backlog	Number of state and tribal correspondence items in EPA's Correspondence Management System (CMS) not responded to within the applicable statutory or regulatory timeframe or, if none exists, within the standard CMS deadline of 10 days	Sum of overdue state and tribal correspondence responses.	Monthly report provided by OEX.	Monthly
A06	SM-16	Overdue FOIA requests	Number of FOIA requests not completed by the statutory deadline or an agreed upon deadline. Statutorily, EPA has 20 working days to process a request, or invoke a 10-working day extension for "unusual circumstances." Count when response time is greater than 20 working days without an extension and 30 working days with an extension; exclude those requests with an agreed upon extension with the requestor unless the agreed upon extension deadline has passed.	Sum of the number of pending requests that have not been processed within working 20 days, or 30 working days with an extension; include those that have an agreed upon extension with the requestor that is overdue.	FOIA Online. A report is being developed that will be used to track this measure. No need to track until the report is available.	Monthly
A07	SM-19	Legal deadlines missed	The number of actions with legal deadlines that are not met on the last day of each month. Does not include deadlines tracked in other agency-wide or regional office measures (e.g., SIPs, FOIA, rulemaking, State/Tribal requests, etc.).	Count made on last day of each month of the number legal deadlines legal deadlines not met. That is, if the deadline was missed on the 10th but the action was taken before the last day of the month (e.g., on the 20th), it should not be in the count. The count is only those deadlines which are still overdue on the last day of the month.	OGC developing a systematic means to track and report. No need to track until the report is available.	

Metric ID	Strategic Measure	Performance Metric Title	Metric Definition	Algorithm	Data Source	Update Frequency
A08	-	Submission of Information Collection Request (ICR) Renewal Packages not submitted to OEI On Time	TBD	TBD	TBD	TBD
A09	-	Severe and High Vulnerabilities open for over 30 days	This Agency-wide measure tracks the number of known vulnerabilities, with a severity rating of severe or high, that fail to be remediated or mitigated within 30-days. A vulnerability is a weakness that, if exploited, can reduce an information systems' security posture affecting confidentiality of information, availability of information or an information system, or the integrity of information.	The cumulative count of severe and high rated vulnerabilities that remain unresolved for a period in excess of 30-days.	Nessus Tenable	TBD
A10	-	Late OIG audit corrective actions	TBD	TBD	TBD	TBD
A11	-	Unimplimented GAO corrective actions	TBD	TBD	TBD	TBD
A12	-	Timeliness of Supervisor Approval of Employee Travel Vouchers	TBD	TBD	TBD	TBD

Message

From: Tracy Mehan [tmehan@awwa.org]
Sent: 3/14/2018 6:05:00 PM
To: Ross, David P [ross.davidp@epa.gov]; Forsgren, Lee [Forsgren.Lee@epa.gov]; Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: FW: LCR Comments
Attachments: APWA.pdf; Detroit.pdf; Durango.pdf; ECOS LCR Comments.pdf; Ferndale.pdf; Grand Rapids.pdf; Mayors NLC NACO LCR Comments.pdf; MIAWWA EPA LCR Comments.pdf; MWRA LCR comments.pdf; Newport News LCR Comments.pdf; NRWA LCR Comments.pdf; Pueblo CO.pdf; Slaughter and Moore.pdf; South Bend.pdf

FYI.

Tracy

From: Steve Via
Sent: Friday, March 09, 2018 4:54 PM
To: Tracy Mehan <tmehan@awwa.org>
Subject: LCR Comments

Attached are utility and utility association comments other than ones you already have in hand.

Several states have uploaded comments as well.
Steve

Steve Via
Director Federal Relations, AWWA | 202.326.6130

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March 7, 2018

Ms. Iliriana Mushkolaj, PhD
Physical Scientist
Office of Standards and Risk Management
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue NW
Washington, DC 20460-0001

RE: Request for public comments Lead and Copper Rule UMRA/Federalism Consultations, Docket No. EPA-HQ-OW-2018-0007

Dear Ms. Mushkolaj:

The American Public Works Association (APWA) appreciates the opportunity to submit comments on the Environmental Protection Agency's public comments for the Lead and Copper Rule (LCR) UMRA/Federalism Consultations. APWA was grateful to participate in the federalism consultation meeting at EPA headquarters on January 8th, of this year, and we look forward to continuing the conversation about revising the LCR.

Protecting the nation's drinking water is essential to public health and the quality of life our citizens enjoy. APWA's over 30,000 members play a critical role in providing clean and safe water to their communities which are large and small, urban and rural. Chief among their responsibilities are the planning, design, construction, operation, and maintenance of water supply systems of all sizes. Our members include public works professionals from cities, counties, and special districts, as well as their private sector partners. Our members take their responsibilities seriously, and they are committed to a partnership with federal, state, regional, and local partners in assuring a sustainable future.

As you know, recent events have made lead exposure in drinking water a key subject for communities across the nation. The membership of APWA is committed to reducing lead

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contamination in our nation's drinking water. Moreover, our members will work to provide EPA information and expertise on how to best proceed in achieving that goal in all communities, both large and small, rural and urban.

With that in mind, APWA would like to make the following recommendations regarding revisions to the LCR:

1) Require all systems with known lead service lines, regardless of population served, to install and maintain corrosion control treatment (CCT).
2) Dedicate additional EPA and other federal funds to providing resources (direct funding, technical assistance, incentives, etc.) to small and disadvantaged systems to help in installing and maintaining CCT.
3) Make regular evaluation of their CCT a requirement for systems that would be reviewed by the state with primary regulatory authority.
4) Implement a "sliding scale" for installing CCT, with smaller systems a longer period to install and optimize CCT.
5) Make completing a full inventory of lead service lines an Agency priority, with the goal of allowing water utilities to use the inventory to assist in replacement of those lines in their service area.

As acknowledged at the January 8th meeting, the LCR has a multitude of issues that make implementation and enforcement difficult. First and foremost is the fact that the LCR requires sampling in homes, the only drinking water regulation with this requirement. This sampling is often done by consumers, and the specific sampling procedures outlined in the LCR are not always followed. This information often casts doubt on the efficacy of the samples provided to water utilities, leading to additional sampling being required by the utility.

Next, the LCR requires action by water systems only after an event, rather than prior to potential problems being identified. As specified under the LCR, action is only needed once the 90th percentile of samples exceeds the lead action level.

PRESIDENT
William B. (Bo) Mills, Jr., PWLF

EXECUTIVE DIRECTOR
Scott D. Grayson

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Finally, one of the more cost-effective and proven solutions for reducing lead contamination, corrosion control treatment, is either not used, as is the case with smaller systems, or not fully optimized, as is the case in many systems of all sizes.

One solution that has been discussed at length in the past few years is that of full lead service line replacement. For the purposes of these comments, the term "lead service line" is taken to mean the lateral running from the water main into the residence. Various organizations across the country, in the wake of the crisis in Flint, Michigan, were quick to advocate for EPA to issue a mandate for this option. However, there are multiple issues with this alternative that make it unfeasible at the current time.

The first issue is that of our base knowledge about the location and number of lead service lines in the country. Estimates on the number of lead service lines have ranged from 6 million to 10 million. Our knowledge of the location of the lead service lines is also limited to using blueprints from home construction, as there is no single inventory of the lines. Creating such an inventory may be a step towards a long-term solution like full lead service line replacement but does little to prevent lead contamination right now.

Next, there is a question of how "full" this replacement process would be. In most communities in our country, the lead services lines are only partially owned by the water utility, requiring homeowners to replace the portion of the line that is privately owned. Many homeowners or renters would likely be unwilling or unable to replace the portion of the line in their home or residence. That being the case, replacing only the publicly owned portion of these lines would have limited effect on lead contamination, as there would still be many lead lines that service individual residences. Additionally, replacement of the lead service lines could have unknown effects on the distribution system, which would require additional planning and cost to remedy. In fact, there is significant evidence that a partial lead service line replacement could result in increased lead levels in homes.

Perhaps the most prohibitive factor in full lead service line replacement is the cost of replacement. A conservative estimate of 6 million lead service lines replaced at an average cost of $4,700 each would total $28.2 billion. In a worst-case scenario, that cost would balloon to

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$123 billion. That figure would be on top of the EPA-estimated $600 billion or more that is needed for investment in our nation's water infrastructure. These figures also may not account in full for permitting, municipal oversight, EPA oversight, reconstruction costs, prevailing wage laws, future compliance costs, and economic impact of the construction itself. Simply put, the cost makes full lead service line replacement unfeasible at the current time.

A reasonable case study would be the City of Ypsilanti, Michigan. The City, with a population of roughly 20,000, undertook a project in 2003 to replace a portion of the publicly-owned lead service lines within their drinking water distribution system. Overall, the City replaced 750 out of 3,000 lead service lines, at a cost of $1,800 to $2,000 per line. Adjusted for inflation, the City was able to replace only one quarter of the total lead service lines in its system at a cost of $2.25 million dollars (a figure that was in addition to regular operations and maintenance of the system). And, as previously noted, this project only replaced the publicly-owned portion of the line, which could very well generate increased lead levels within the residence. After the public portion was replaced, the resident was notified if there was lead on their side of the property line, and that they could replace that portion at their cost.

Our recommendations to the Agency, given what we have already stated, is to focus on CCT as the best option for immediate reduction of lead contamination in drinking water. That is not to say that installing and maintaining CCT does not have its own challenges. Water utilities will need to balance CCT with other demands from other National Public Drinking Water Regulations, as well as variables unique to that system, such as system composition and water quality.

Also, installing and maintaining CCT will have its own associated costs, which are not insignificant. However, when compared to the enormous costs of full lead service line replacement, the cost is much more manageable. The benefit of CCT, when compared to full lead service line replacement, also shows CCT to be the better option.

Phosphate-based corrosion inhibitors are widely used, and their effects are well-known. That being the case, there is little need for extensive research on implementing their wider use. There are other treatments, such as silica-based corrosion inhibitors, that require further research, and

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may be used in systems where phosphate-based methods are impractical for various reasons. Again, the associated costs with researching new corrosion inhibitors pales in comparison to full lead service line replacement.

To that point, the true costs of CCT implementation are significantly less than full lead service line replacement. According to the Agency, a water system serving between 25 and 100 customers that initiated a centralized orthophosphate treatment CCT would face capital costs of $18,000 and annual operations and maintenance costs of $2,000 per year. That second figure aggregates to an annual household cost of $78 per year. For larger systems, the cost is much more widely dispersed. A system serving 100,000 to 500,000 customers implementing the system previously mentioned would incur capital costs of $92,000 with annual operations and maintenance costs of $265,000 per year. The cost of operations and maintenance of such a system would average out to $2 per household.

On top of these costs, there is a need for EPA to install a more rigorous evaluation process for CCT in systems across the nation. It would serve the communities well for EPA, along with the states of primary regulatory authority, to conduct periodic reevaluations of CCT programs at systems to ensure that the treatment programs being utilized are truly optimized. This evaluation process should be more intense immediately after installation, to ensure that any necessary changes are made as quickly as possible.

While the costs of installing and maintaining CCT are much less than full lead service line replacement, they are not insignificant, especially for smaller or disadvantaged systems. Simply put, these systems do not have the resources to carry out this project on their own. It is important that EPA make every effort to ensure that these systems are provided every available resource to make the adoption of CCT as universal as possible.

For that to be the case, the Agency should make additional federal funding available for this express purpose. EPA should also continue its public outreach, technical assistance, and other education programs on CCT, specifically, for small and disadvantaged systems. Additionally, the Agency should explore ways to incentivize systems with optimized CCT in place to provide technical assistance to smaller and disadvantaged systems that do not. Finally, the Agency

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should investigate the potential for implementing a "sliding scale" of CCT installation and optimization. Under this scale, smaller systems, or those with less resources, are given a longer period in which to install CCT in their systems, given that they will require a longer period to amass the necessary resources for the enterprise.

On behalf of public works professionals nationally, we thank you for the opportunity to comment and urge you to give serious consideration to the above comments. We are committed to working with the Agency on our common goal of clean water. If you have any questions, please contact Sean Garcia in our Washington, D.C. office at sgarcia@apwa.net or at 202-218-6734.

Sincerely,

Scott D Grayson

Scott Grayson
Executive Director

Detroit Water & Sewerage Department
City of Detroit

Office of the Director
Water Board Building
735 Randolph Street, Suite 506
Detroit, Michigan 48226-2830

March 8, 2018

Peter Grevatt
Director, Office of Ground Water and Drinking Water
1200 Pennsylvania Avenue, N. W.
Mail Code: 4601M
Washington, DC 20460

RE: Long-Term Lead and Copper Rule Federalism Consultation (Docket ID No. EPA-HQ-OW-2018-0007)

Dear Mr. Grevatt,

The Detroit Water and Sewerage Department (DWSD) of Detroit, Michigan appreciates the opportunity to offer comments to the U.S. Environmental Protection Agency as part of its federalism consultation on potential long-term revisions to the Lead and Copper Rule (LCR). Our system is a member of the American Water Works Association, a participating association in this federalism consultation, hence our submittal.

DWSD's service area has an estimated 2,700 miles of water mains serving a population of approximately 680,000, of whom over 35 percent have incomes below the U.S. federal poverty line. Detroit has an estimated 125,000 lead service lines (LSLs), aged and historically under-maintained water and sewer pipe networks, and high incidences of water and sewer line breaks.

The Great Lakes Water Authority (GLWA) – DWSD system, like all urban water suppliers, is complex. Public health protection is achieved through an array of functions (e.g., water treatment, transmission and distribution system operation) of which lead risk mitigation is but one aspect. Like many older U.S. cities, DWSD requires major system reinvestments to ensure its facilities can continue to deliver high quality potable water and provide adequate fire protection.

Water affordability is an acute issue in Detroit. Median residential monthly water, wastewater and drainage service costs are $71.94 per month or 3.3 percent[1] of Detroiters' Median Household Income, and already represent a high burden.[2] Further rate increases will be required to both pay for GLWA

[1] Median monthly service bills as listed on DWSD website, Explanation of Residential Charges: http://www.detroitmi.gov/Portals/0/docs/DWSD/Explanation%20of%20Charges%20-%20Residential%20Customers-%202017%20FINAL.pdf?ver=2017-08-04-104826-767, accessed January 17, 2018; Detroit Median Household Income in 2016 dollars based on U.S Census data: https://www.census.gov/quickfacts/fact/table/detroitcitymichigan/PST045217, accessed January 17, 2018
[2] Bill amounts are based on average monthly residential water usage of 5 CCF. The "High Burden" designation is based on EPA financial capability assessment guidance that uses utility costs as a percentage of Median Household Income to determine levels of economic burden. See United States Environmental Protection Agency, "Combined Sewer Overflows — Guidance for Financial Capability Assessment and Schedule Development," EPA 832-B-97-004,

services and support reinvestments in DWSD's infrastructure systems. Though DWSD has among the nation's most comprehensive and compassionate customer assistance programs, there are limits to the extent these programs can insulate low-income users from burdens of system-wide rate increases. It is through this context of water affordability that DWSD must consider revisions to both the state and federal Lead and Copper Rules (LCR).

DWSD is committed to a program to minimize lead risks in drinking water, including full lead service line replacements (FLSLRs), as expeditiously as practicable. We anticipate effecting 1,000 to 3,000 FLSLRs per year in conjunction with our repair or replacement of 30 miles or more of non-lead water mains in our distribution system. We hope to increase the pace of these replacements in the event that appropriate funding is made available given that the total cost for lead service line replacements in Detroit is estimated at $438 million to $625 million.[3] In the interest of minimizing near-term lead exposure risk, we are also implementing a variety of public communication and education measures, as well as changing operational protocols. DWSD is already advancing the intent of the proposed revisions to the Michigan LCR, and DWSD would like to see similar proactive measures become the norm across the water industry as part of the federal LCR.

The following sections present DWSD's responses to specific questions EPA presented at the Federalism Consultation Meeting.

What are the opportunities and challenges to state and local governments if EPA were to modify the LCR to:

– Require systems to create an inventory of lead service lines

The Detroit Water and Sewerage Department (DWSD) has made a proactive decision to begin a FLSLR program as a part of DWSD's comprehensive asset management-based infrastructure replacement program. Detroit has an estimated 125,000 of Michigan's 500,000 lead services. A critical starting point for an asset management program is an accurate inventory of assets and the condition of those assets. DWSD supports a requirement for water systems to create an inventory of lead service lines so they can notify customers of the risk of lead exposure and effectively design a lead service line replacement plan. An accurate inventory of lead service lines is the fundamental starting point for mitigating lead risks from drinking water systems.

EPA should consider the requirements for the lead service line inventory as in the proposed Michigan LCR. This includes a preliminary and verified lead service line inventory, assumes service lines of unknown material are lead until proven otherwise, and requires notifying the resident within 30 days of confirming a lead service line serving the home. The inventory must be updated every 5 years.

February 1997. USEPA Memorandum: "Assessing Financial Capability for Municipal Clean Water Act Requirements"; from Nancy Stoner and Cynthia Giles to EPA Regional Administrators, Regional Water Division Directors and Enforcement Division Directors; January 18, 2013, pp. 2.

[3] Based on estimated independent full LSLR unit costs of $3,500 to $5,000 per service line times an estimated 125,000 service line inventory. These costs may be moderated through integration of full LSL replacements into DWSD's asset management based water main replacement program. Preliminary estimates suggest that the incremental cost of full LSLR under the proposed Michigan LCR (that would require replacement of all lead service lines within 20 years) is approximately $444 million.

– Require proactive full lead service line replacement on a specified schedule (e.g., 10, 15, 25, 35 years from promulgation)

DWSD supports the full replacement of lead service lines as part of an overall asset management strategy as the most effective and efficient means of reducing lead risks in drinking water systems. All public water systems with lead service lines should develop a plan for replacing all lead service lines, and full lead service line replacement should be a standard practice in everyday operations. DWSD believes that a one size fits all schedule is not appropriate. Lead service line replacement schedules must accommodate the size and population served by the water system, the number of service lines, and balance other public health risks faced at the water supply.

Detroit faces daunting challenges in addressing the pernicious legacy of lead service lines and leaded plumbing in our community. We have by far the largest number of lead services among Michigan communities, roughly estimated at 125,000, and supply water to a residential population where over 35 percent of citizens live below the U.S. federal poverty line.[4] Nevertheless, DWSD is committed to a program to minimize lead risks in drinking water, including FLSLRs, as expeditiously as practicable. As mentioned previously, we anticipate completing 1,000 to 3,000 FLSLRs per year in conjunction with our repair or replacement of 30 miles or more of non-lead water mains in our distribution system through our asset management program.

Given the historical decline in residential property values and the acute poverty rates in our community, we recognize that full responsibility for funding FLSLRs cannot practically be laid on residential property owners.[5] We are investigating utility supplier measures to broaden funding responsibility and are evaluating potential service rate revenue constraints and impacts.

– Allow partial LSLR only for emergency repair or "unwilling or unable customers" when conducting infrastructure replacement (e.g., main replacement)

DWSD would like to see the revised LCR focus on achieving four outcomes: 1) Economic Prosperity, 2) Healthy Environment; 3) Reliable High-Quality Service, and 4) Value for Investment. A revised LCR that continues to allow and condone PLSLRs works against each of these outcomes. PLSLR is expensive, produces high lead release, leaves old high-risk service lines in place that are even more expensive to replace at a later date, and pushes complete removal further into the future leaving the cost to be borne by both the resident and the water utility in the future.

DWSD is working to limit partial lead service line replacements (PLSLRs) to temporary emergency situations when residents cannot be contacted prior to replacement of the LSLs. PLSLRs are happening every day in Detroit and in cities across the United States. Even though PLSLRs occur at significant cost, lead pipes must be repaired, replaced and reconnected for continuation of service. The practice of PLSLR creates a large documented, preventable release of lead to drinking water. The fact that trenches and pipes are already exposed for PLSLR means that the incremental cost for FLSLR at the time of PLSLR is

[4] This is more than twice the average Michigan poverty rate of 15 percent. Data from the U.S. Census Reporter. https://censusreporter.org/profiles/16000US2622000-detroit-mi/ — accessed December 29, 2017.
[5] Residential property owners were not historically apprised of the risks of lead service lines with the purchase of their homes, and in some cases, LSL replacement costs would represent a disproportionately large share of property value.

the smallest it will ever be. Water supplies need support from the LCR to remove the entire lead service line risk so that both cost and risk can be minimized.

– Require pitcher filters to be distributed and regularly maintained by the PWS for three months immediately following lead service replacement

After a comprehensive review of DWSD's lead service line replacement procedures, DWSD began distributing pitcher filters to all homes with lead service line replacements during construction and providing replacement cartridges to last six months. Based on DWSD's lead sampling results this is a necessary step to protect residents in the home from lead exposure during and following the replacement, and it is an appropriate step for all water systems that replace lead service lines. DWSD relies on pitcher style filters that do not require in-home installation. DWSD provides all the instructions for maintaining the filter provided by the manufacturer, as well as aerator cleaning and flushing instructions to be used during construction and following replacement. DWSD believes this provides customers with the resources necessary to protect themselves while not placing an undue and administratively problematic burden on DWSD for maintaining the filters during this period.

What are the opportunities and challenges to state and local governments if the LCR was modified to:

– Target systems required to install CCT differently:

- **Change the current system size threshold (50,000 people served), or**
- **Require systems with lead service lines (regardless of population served) to install and maintain CCT?**

DWSD believes that all water systems with lead service lines should be required to provide corrosion control treatment and this requirement should not be dependent upon the population served by the public water system. DWSD believes that revising the sampling protocol under the LCR and lowering the action level will provide critical incentives for public water systems to further evaluate and optimize corrosion control, resulting in reduced risk of lead exposure for all customers during the period when lead service lines are being permanently removed from service. This expanded focus on corrosion control treatment will require enhanced oversight from state public water system supervision programs to realize the greatest public health benefit.

The following revisions will also improve the reliability of corrosion control and public health protection provided by the LCR:

- The LCR should require a corrosion control study by default in anticipation of all source water and treatment changes, with sufficient time for states to evaluate and approve the appropriate treatment modifications necessary to maintain safe drinking water.
- There must be requirements for all water systems that exceed the action level to complete a corrosion control optimization study.
- All small and medium water systems applying corrosion control treatment must maintain treatment even after they drop below the action level. Ceasing the use of corrosion control treatment as soon as a water supply meets the lead action level does not result in reliable public health protection.
- If any water system exceeds the lead action level again after applying optimal corrosion control, they must re-evaluate their corrosion control treatment.

– Change the requirements for designating optimal CCT to:

- **Prescribe a default CCT that must be maintained unless a system can demonstrate equivalent CCT to the state, or**
- **Require the system to conduct a periodic re-evaluation of CCT to be reviewed by the state?**
- **Require system to find and fix problems in corrosion control treatment if a tap sample exceeds an action level?**

DWSD does not believe that a default CCT for all water systems will adequately address variability in source water quality and treatment; this strategy will result in unnecessary expenses for public water systems that do not contribute toward the goal of minimizing lead exposure for the entire community served by the water supply. Corrosion control treatment should only be used that is appropriate for a water systems' source water, treatment, and distribution system materials.

DWSD believes that corrosion control treatment decisions should be reviewed by the state. States should have the authority to require a system to conduct a re-evaluation of CCT at any time. Any system-wide action level exceedance should trigger an evaluation of corrosion control effectiveness to find whether issues with corrosion control treatment are the cause of the exceedance so that the appropriate fix can be made to minimize exposure to lead in drinking water system wide.

In addition, water quality parameters (WQPs) should be used only for monitoring corrosion control treatment; WQPs are not reliable indicators of lead release, so public water systems should not be issued violations when they exceed the designated WQP ranges for their system. States should be able to add relevant WQPs as appropriate based on PWS water quality and treatment, including chloride, sulfate, manganese, iron, aluminum, and others.

What do state and local governments think are the most effective ways for water systems to deliver educational information to consumers? What opportunities and challenges would state and local governments face if the LCR was revised to require:

– Water systems to provide on-going targeted outreach with a special emphasis on all customers with lead service lines?
– Water systems to provide notification to consumers within 24 hours of exceeding an action level (as required by the 2016 WIIN Act)?
– Water Systems to make information accessible to consumers on results of all tap sampling, results of water quality parameter (WQP) monitoring and the number and locations of LSLs?

DWSD believes that strategies for delivering educational information to consumers should be updated to reflect modern ways that we receive information. Modern technology should be used to enhance traditional media outreach. Direct email and texts, Twitter, and Robocalls can be used to quickly notify customers of lead levels either at individual homes or of a system wide action level exceedance. Posting information on a website is not effective outreach unless it is widely shared via email messaging, messages in bills, and other regular contact water systems have with customers. Newspapers and radio no longer have the reach that they achieved in past decades prior to the explosion of online media, streaming radio, and social media platforms. Additional strategies are necessary to adequately share information about lead risks.

Frequently the populations at greatest risk of lead exposure are even more challenging to reach due to non-English speakers, low literacy rates, high poverty, and limited time for staying current with news. The revised LCR must include requirements for reaching and communicating effectively with these populations. Smart phone applications, videos, and graphics heavy materials can be used to communicate with customers and receive information from customers, including service line pictures.

DWSD strongly believes that customers must be notified of the presence of a lead service line delivering water to their home. Customers cannot take appropriate precautions if they do not know the risk present in their home. Transparency is critical for maintaining trust in public water systems. DWSD is working to make information accessible to consumers on the results of all tap sampling, and the number and location of LSLs. Withholding this critical information places customers at risk of exposure and raises suspicions that public water systems are not adequately protecting public health.

DWSD supports providing lead in water information to schools, childcares, assisted living, and doctor offices so those groups can push information to their target audiences and communicate more effectively about the risk of lead in drinking water.

Water quality parameter monitoring should also be available to the public, but requires adequate explanation and interpretation to allow customers to understand the data.

What are the opportunities and challenges for states and local governments if the rule changed sampling protocols, including:

– Changing where water systems are required to collect tap samples?

- **At sites based on customer request,**
- **At schools served by the system**

DWSD offers sampling at homes based on customer request, but these are in addition to lead sampling according to the sampling plan required under the LCR. Sampling at homes per customer request is prudent to maintain trust in public water systems. However, customer requested samples will not provide a scientific sampling design on which to make compliance determinations. DWSD recommends that the revised LCR allows for sampling based on customer request, but these samples should be collected in addition to required compliance samples. The only appropriate exception would be if a customer requested sample meets all criteria for a compliance sample site and appropriate documentation is available to include that site in the sampling pool.

Lead exposure assessment at schools and other large buildings requires an entirely different sampling strategy compared to compliance sampling designed to measure treatment effectiveness under the LCR. Schools that receive water from public water systems should be responsible for providing low lead or lead free water on campus, rather than the public water system. Schools should have clear requirements for providing very low lead or lead-free water; any sampling at schools should not take away from compliance sampling at individual homes per the construct of the LCR. A separate set of requirements for schools to assess lead in drinking water is appropriate and should consider whether provision of lead filtering stations with verification sampling can provide an alternative remediation strategy. This could provide safe drinking water while delaying capital improvements to a time when the entire school is being renovated. DWSD believes that public water systems should work collaboratively with the schools they serve to address any water quality issues faced at the school.

– Change the way samples are collected to be more representative of exposure?

- **Increase the number of samples required**
- **Instruct consumers to sample when they are drawing water for drinking or cooking.**

The sampling protocol in the proposed Michigan LCR requires two samples at each lead service line home for LCR compliance sampling: after a minimum of 6 hours of stagnation, the sampler collects the first liter and the sixth liter out of the tap. This sampling strategy greatly improves the detection of lead contributed by the lead service line and more accurately represents the risk of lead release from lead service lines. However, this continues the challenges of relying on homeowners to implement increasingly challenging sampling procedures.

While DWSD supports the improved quality of information from lead service line samples, DWSD recommends exploring alternative sampling strategies that can be more easily implemented by water utilities and provide better information for measuring lead release. A strategy relying on random daytime sampling would reduce the reliance on customers for maintaining stagnation time and proper sampling procedures, and it would allow public water system staff to collect proper samples to determine compliance with the rule. For example, EPA should consider the random daytime sampling approach used in the UK. EPA could explore pilot projects to evaluate and compare the effectiveness of different sampling constructs that could be used in a revised LCR. While this sampling approach would increase the total number of samples required under the LCR, it would allow public water systems to provide better quality control for sampling procedures and address some of the long-term challenges with maintaining a consistent sampling pool.

• EPA would appreciate any information, and specific data, state and local governments could provide on their experiences with:
– lead service line replacement

DWSD is willing to share our full lead service line replacement program.

Sincerely

Gary Brown
Director/CEO of the Detroit Water and Sewerage Department

Here are our comments to the proposed Pb/Cu rules from the City of Durango Water Treatment and Water Distribution Divisions

Lead service line replacement (LSLR)

- Monumental task to create inventory of lead service lines, and full replacement of identified lead lines. Will financial assistance be provided to small/medium sized systems who do not have the resources and other challenges (labor, money, weather constraints)? What kind of timeline is proposed for this task if it is enacted?
- Is this full service line replacement? Or is a partial line replacement being proposed?
- Partial LSLR for unwilling or unable customers defeats the purpose of lead replacement. If sampling at a consumer tap exceeds the AL, and the PWS is required to remove the LSL, and the consumer is unwilling to replace the LSL will the PWS face fines/corrective actions? What happens when the ownership of that residence/business changes? Will the PWS be required to replace LSL then?
- Pitcher filters after LSLR, will financial assistance be provided to medium sized systems? How does the PWS comply/document the pitcher is regularly maintained when it's in a private residence? What about systems who have non-aggressive water, would they be exempt?

Corrosion Control Treatment (CCT)

- Will financial assistance be provided to medium/small PWS's to engineer and install CCT? Will O&M training and guidance be provided to small/medium PWS's who lack the expertise in CCT optimization?
- Point of use treatment – Will financial assistance be provided to procure and install these devices? How does the PWS comply/document the device is regularly maintained when it's in a private residence? What about systems who have non-aggressive water, would they be exempt? This approach, while is cheaper at first is just a Band-Aid to the problem. Continues distrust in the safety of the PWS drinking water.
- Will waivers to be issued to PWS's who have non-aggressive water? How does a PWS demonstrate an equivalent CCT? Will the periodic re-evaluation be reduced if evaluations are consistent time and time again?
- Find and fix problems in CCT if a tap exceeds AL – What happens if there is a sampling error causing a false high positive? Some residents have taken the approach that if 6 hour stagnant time is required, why not a longer time, some have used a never/seldom used faucet to sample from resulting in skewed results not representative of the actual water consumed.

Transparency and Public Education

- Will EPA/CDPHE provide required language to be distributed to consumers? Will consumers believe the educational information PWS's give them? There is deep distrust in government at all levels.
- On-going outreach – What is that frequency, every year, 6 months, 3 months? Required language?
- How long will the results of all tap sampling, water quality parameter monitoring, and number and locations of LSL's be available to the public? Can that database be online? What happens when a LSL is removed, can that be removed from the public accessible database?

Tap sampling

- Sampling at schools would allow PWS's assurance that proper sampling techniques are being followed. Changing tap sampling site at consumers request can create problems for PWS trying to obtain representative samples.
- Increasing the number of samples, the challenge will be to find appropriate sites to sample for Pb/Cu. Instructing consumers where to sample sounds easy, but might not be able to comply due to minimum 6 hours water must remain still in plumbing, and consumers waking up having to go the bathroom and flush, or need a drink, but sampling must take place at kitchen faucet, and they forget.
- Household action level, would those limits be specific to each household, or one set of limits for all households? Who contacts the applicable health agency for follow-up?

Copper Revisions

- Who establishes and conducts the screen determining if water is aggressive to copper? Will a pilot distribution system be utilized, who is responsible for expenses to run and test pilot system?
- Why have separate sampling sites from lead sample sites? Creates additional in home sampling requirements when existing sampling for Pb/Cu is challenging as it is to conduct.

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March 8, 2018

Ms. Iliriana Mushkolaj, PhD

Physical Scientist

Office of Standards and Risk Management

U.S. Environmental Protection Agency

1200 Pennsylvania Avenue NW

Washington, DC 20460-0001

RE: Public comments - Lead and Copper Rules UMRA/Federalism Consultations, Docket No. EPA-HQ-OW-2018-0007

Dear Ms. Mushkolaj:

Thank you for the opportunity to offer comments to the U.S. Environmental Protection Agency as part of the Lead and Copper Rule (LCR) federalism consultation. The City of Ferndale Michigan's water system serves 10,000 homes and businesses with a population of 20,000. We purchase our water from GLWA / Detroit Water and Sewer Department.

First and foremost, addressing lead exposure is a collaborative responsibility between federal, state and local agencies. This responsibility extends across multiple state and local departments, not primarily water service providers. Without the coordinated actions across state and local health departments, water service providers and licensing agencies, the ability to identify and eliminate sources of lead exposure will continue in a haphazard manner. Investments must strategically address multiple sources of lead exposure, including paint and dust, soils, indoor plumbing, lead service lines and other household items. Furthermore, specific drinking water solutions at the local level must recognize the shared responsibility between consumers and water service providers.

With this background, we offer the following considerations as part of this federalism consultation:

- When a change in source water is proposed, a coordinated evaluation and technical analysis must occur to address potential corrosion control treatment requirements.
- A federal rule that requires all water systems to use the same corrosion control treatment does not address allow for flexibility for local water quality and operational considerations.
- Incorporate lead service line replacements as part of the community's asset management program. A community's asset management program facilitates strategic investments and collaborative approaches to implement infrastructure improvements across multiple jurisdictions within the same public road right-of-way areas. Lead service lines are part of older water main systems that are likely in need of replacement; thus these infrastructure improvements should be completed in a coordinated manner with the existing federal requirements as a backdrop to address priority areas.
- This asset management approach will allow state and local agencies to implement a lead and copper rule that is protective of public health and within available resources. It will also ensure that local governments have the ability to continue investing in needed drinking water, sanitary sewer, and stormwater infrastructure improvements so that a different set of public health problems does not arise from unintended consequences of newer, more stringent lead service line replacement requirements. We recommend you review the State of Michigan's 21st Century Infrastructure Report about the benefits of asset management programs in addition to the upcoming final report for the state's pilot asset management project.
- A multi-agency approach is critical to effectively reducing all lead exposure and identifying the exact source for each unique situation. A lead service line replacement requirement outside of the asset management approach fails to consider whether lead plumbing or fixtures within a house are sources of lead exposure. Likewise, state health agencies that respond to high blood level results in children primarily focus on lead exposure from paint, dust and soil. Aligning these agencies and programs will result in a targeted approach for all lead dangers.
- Within the SEMCOG region, there are various instances where state and local agencies coordinate to address individual cases of high lead blood level results. None of these cases have resulted in identifying water as a source of exposure. In fact, communications with our region's health departments have determined that lead paint and dust continue to be recognized as the primary source of lead exposure and resulting high lead blood levels. When those circumstances determine that a lead service line is a source of lead exposure, then water service providers should replace the public side of the lead service line; however, that must be complemented by coordination with the private property owner to pay for the private-side replacement.
- A multi-agency approach is also supported through the healthcare community. In 2016, the State of Michigan established the Child Lead Poisoning Elimination Board because "….there exists a need in state government for a coordinated effort to design and long term strategy for eliminating child lead poisoning in the State of Michigan."

  Some key statements from their report, *Child Lead Poisoning Elimination Board, A Roadmap to Eliminating Child Lead Exposure*, include:

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- "A greater focus on primary prevention will also require the recognition and coordinated targeting of all lead dangers.
- Health equity must be the foundation of all policy and funding recommendations, with areas of disparate lead exposure given higher priority.
- By far the most common identified form of lead exposure for children is through lead paint and lead dust in older homes...
- The board proposes that its recommendations be prioritized so that known sources of ongoing exposure (those houses, apartments, and other structures and areas where child lead exposure has been identified and where families continue to live or visit) are addressed first.
- The board further proposes that prioritization of its recommendations to eliminate exposure risk be based on the likelihood that a particular type and level of exposure will result in child EBLs. The only way to truly eliminate child lead exposure is to test every child in Michigan and then target well-defined, high-risk areas to provide a comprehensive, targeted remediation approach."

- Finally, sound data and science need to be used in drafting these rules. We encourage the EPA to continue working on the nationally, peer-reviewed process for setting health-based standards for lead in drinking water.

Additional considerations for the Key Areas for Rule Revisions are provided as follows:

1) Lead Service Line Replacement

- The State of Michigan estimates that there are approximately 500,000 lead service lines within Michigan. At a conservative EPA estimate to replace each service line, this would represent a $2.35 billion investment. Michigan's 21st Century Infrastructure report conservatively estimates an annual infrastructure investment shortfall of $4 billion.
- A public-side lead service line material inventory can be developed over time, but as part of asset management programs. There is no single inventory of all lead service lines. The importance of creating this inventory through asset management programs will allow water service providers to refine inventory information in conjunction with other water system activities, and coordinate, when needed, during specific case management evaluations of lead exposure. The information about pipe material on private property is very limited and not part of any water service provider records.

  A physical inventory of lead service lines requiring exposure of underground infrastructure that is not performed in conjunction with any infrastructure improvements is not cost-effective. While looking at the incremental cost may appear manageable for discrete requirements, taken in total these costs will exacerbate affordability issues for many

Americans. Focusing on an ongoing records evaluation to develop a preliminary material inventory combined with lead service line replacement as part of asset management programs will incrementally work towards the ultimate goal of eliminating lead in these systems in the most cost-effective manner.

- Additionally, and as mentioned above, evaluating lead service line replacement as part of other collaborative lead exposure programs at the state and local levels will successfully integrate those critical timeframes to address the source of lead exposure.
- Furthermore, there are multiple opportunities to address lead service line replacement outside of the water rule. These include rental inspections, property transfers, licensing of facilities such as day care and retirement/senior centers, etc.
- Finally, the most critical consideration is related to the use of public funds on private property. While most recognize that partial lead service line replacement may increase lead levels within drinking water, the EPA must consider alternatives to successfully implementing full lead service line replacements. The private side of lead service lines must be funded outside of the water service provider rate base and likely in a manner that may require a private property to work in conjunction with the local water service provider.

2) Corrosion Control Treatment

- As noted previously, any changes in source water must be accompanied by an evaluation and verification for needed corrosion control treatment.
- Corrosion control evaluations should be in response to water quality parameter monitoring in conjunction with other distribution and water treatment process monitoring. Increased water quality parameter sampling should be a consideration.
- The details of corrosion control treatment programs should be developed by the local water service provider with review and coordination at the state level. When changes in water quality occur, then corrosion control re-evaluation should be a consideration. One overarching standard for corrosion control treatment and subsequent re-evaluation requirements does not take into consideration local water quality or operational conditions. Additionally, it may be more cost-effective for smaller water systems to focus on lead service line replacement and result in a greater benefit to public health.
- Providing in-home water filtration systems, faucet filters, etc. are not a function of a public water service provider. Any needed filters are the responsibility of the property owner. Water service providers do not have authority to access private property and especially within existing homes.
- Single samples that exceed the action level should not warrant an investigation of corrosion control treatment. A sample exceeding the action level should first trigger a review of the sampling techniques and procedures, followed by an investigation into the source of the elevated result and then actions to eliminate the source

3) Tap Sampling

- As local communities develop and implement asset management programs that include a lead service line component, the tap sampling should occur in those areas and facilities that are regularly occupied by those populations sensitive to lead exposure. Targeting these areas will also work in alignment with the suggested multi-agency approach described

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above and will lead to enhanced source determination and ultimate abatement and/or remediation/removal.

- This comprehensive approach may also lessen the challenges associated with homeowner sampling that consistently lacks QA/QC procedures. Through this multi-agency approach, coordinated efforts can address all potential lead sources and communicate similar messaging to the public in these target areas, perhaps resulting in increased cooperation for tap sampling and other lead evaluations.

- Public Education and Transparency There are already significant outreach materials regarding lead exposure from other sources. Those programs and materials could be enhanced with topics related to lead service line replacement. The EPA should lead the effort in developing these coordinated materials and making these materials available to states and local water service providers. Public Education efforts will be most successful with consistency in messaging that can be supplemented with local system specifics.
- The 24-hour notification timeframe regarding an action level exceedance is too short. A 3-day notification timeframe is suggested as more feasible timeframe.
- Finally, making water quality parameter monitoring data accessible to the public does not recognize privacy of property owners and may very well result in negatively affecting property values. Additionally, data results are often confusing for the public to understand.

Thank you for the continued opportunity to provide ideas for a solutions-based approach to modifying the lead and copper rule. As we have indicated, this is a much larger public health challenge and one in which water supplies are committed to doing our share. Addressing only the lead and copper rule ignores the opportunities to collaborate with other existing lead exposure programs. Implementing these programs must be completed through asset management approaches that ensure we are protective of public health, without hampering the feasibility of continuing other critical infrastructure improvements (drinking water, sanitary sewer, stormwater and roads).

Please feel free to contact me with any questions regarding our suggestions.

Sincerely,

Daniel Harper
City of Ferndale
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March 8, 2018

Peter Grevatt
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RE: Long-Term Lead and Copper Rule Federalism Consultation (Docket ID No. EPA-HQ-OW-2018-0007)

Dear Mr. Grevatt:

The Michigan Section of the American Water Works Association (MI-AWWA) appreciates the opportunity to offer comments to the U.S. Environmental Protection Agency as part of its federalism consultation on potential long-term revisions to the Lead and Copper Rule (LCR). We are an affiliate of the American Water Works Association, a participating association in this federalism consultation.

MI-AWWA is committed to helping our members to protect consumers of drinking water from exposure to lead. Improving the LCR to further reduce exposure to lead requires community-specific solutions that recognize the shared responsibility between consumers and water systems for managing exposure to lead in drinking water. We also recognize the importance of federal, state and community-wide investment in managing lead exposure from multiple sources including lead paint in housing, lead deposited in soils, sources of lead in schools, lead in other household items and lead service lines.

As EPA contemplates improvements to the Long-Term Lead and Copper Rule, MI-AWWA encourages a focus on actions that are feasible within current statutes so that we can move forward without confusion and additional delay. It is also critical that any requirement to change water chemistry provides flexibility to address local water quality and operational considerations. A federal rule that requires all water systems to use the same corrosion control treatment would be problematic. We hope that our observations assist in developing a protective rule within available resources while avoiding unintended consequences.

Lead Service Line Replacement

Our members have been evaluating lead service line replacement strategies. The current estimate is that there are more than 500,000 lead service lines in Michigan. Some of the challenges our members have identified include the following:

- Limited information on the pipe material in use on each customer's property.
- Customers who are unwilling to replace lead service lines or unable to afford the cost of lead line replacement.
- State limitations on the use of public funds to benefit private property owners.
- Replacement projects require coordination in order to minimize disruption to our community.

Responses to the evaluation document

- A physical verification of lead service lines would place a strain on resources. However, we agree that the inventory should be completed over time as part of a larger asset management program.
- Proactive replacement of lead service lines needs to align with a water system's overall asset management program that integrates with all infrastructure updates. Other infrastructure issues may pose a greater risk to public health and thereby be a priority over lead service line replacement when the action level has not been exceeded. A change in LCR sampling or a change in the action level may impact the schedule for infrastructure updates and may pull resources away from other needed projects.
- Partial lead service line replacement increases the risk of elevated lead levels and creates a public health problem that didn't previously exist. Mitigation measures used in partial replacements are an alternative, but require homeowner cooperation, which is not guaranteed. Both water supplies and individual property owners have challenges to overcome to make full lead service line replacement feasible. If the risk of partial lead service line replacement is to be avoided, it is imperative that funding for the premise piping be funded outside of the utility rate base, along with legislative solutions that compel the private property owner to act in conjunction with the local water supply to effect full service line replacement.
- MI-AWWA agrees in concept that some remediation after lead service lines are replaced is needed. However, the details of the remediation should be left up to the local water supply as details of the replacement and detectable lead levels may allow a variety of approaches. If the rule includes a period of remediation, the language should be broad enough to allow for the local water supply to make the determination of what specific action is needed (filters, filtered-pitchers, etc.).

Optimized Corrosion Control

Because EPA appears to be seriously considering phosphate addition as the gold standard for corrosion control treatment, we ask that you give consideration to:

- Coordination between water and wastewater treatment plants and regulated municipal storm water systems about the impact on meeting NPDES permit limits.
- Potential implications for managing iron and manganese release and the potential for colored water.
- Adjusting pH, which in turn affects disinfection contact time, the maintenance of an effective secondary residual, and disinfection byproduct formation.
- The need to consider other metals like stainless steel as well as concrete pipes.
- Uncertainty that using theoretical solubility and pilot studies alone will necessarily lead to significant lead reductions.

Responses to the evaluation document

- It may actually protect public health best to leave the threshold as is since lead service line replacement for a system with less than 50,000 people served may be a better use of the water supply's resources and offer a greater impact to public health. The best available science should be used in setting any thresholds for action.

- The water supply should not be responsible for installing or maintaining any equipment to mitigate lead levels on private property. Access to private property can never be guaranteed. Any in-home treatment systems, faucet filters, or pitcher filters should be the responsibility of the property owner.
- A default corrosion control treatment program (CCT) may produce unintended consequences. For example, widespread mandated phosphate addition could increase the phosphorous loading to the water resource recovery facilities and hence impact receiving waters. Water chemistry has many complexities and variables that make a default standard potentially problematic. The details of any CCT should be determined by the local water supply working together with the primacy agency.
- We support periodic evaluation of CCT, and increased water quality parameter sampling. Any re-evaluation of a CCT should be based on changes in water quality and the best available science. No predetermined re-evaluation parameters or frequency should be set.
- Requiring investigation of CCT based on a single tap sample exceeding the action level is not appropriate. A single sample is not enough data to determine that there is a problem with CCT. A single sample exceeding the action level should trigger an investigation and evaluation process to determine the source of the elevated level and then mitigation if necessary.

<u>Sampling Responses to the evaluation document</u>

- If the intent of the LCR remains to evaluate the CCT, then more samples may not be meaningful. Any increase in sample numbers should be based on the best available science. If the sampling intent is to address lead exposure, consideration must be given to all sources of lead exposure and should not focus solely on drinking water as that may actually lead the public to be misinformed about their exposure risk.
- Currently, water supplies have testing sites dictated by specific criteria. Most supplies also test upon customer request but that testing does get incorporated into compliance calculations. The protocols are currently based on getting the best overall picture of the corrosion control treatment program. Introducing new/different protocols into the sample may no longer provide a good indication of the CCT's effectiveness.
- MI-AWWA believes that locations such as schools, daycares, hospitals, and other facilities, which are regularly occupied by populations sensitive to lead exposure, should be evaluated separately from requirements in the LCR. The needs and risks of these locations are different and should be separate from the water supply's normal course of water monitoring. These are a mix of public and private entities and so testing of these facilities should be a licensing or public health department issue with support as needed from the local water supply.
- Taking samples during a regular water draw from drinking or cooking may actually introduce other influencers into the sample and skew the overall picture of CCT. This goes back to the intent of the Rule. If it remains evaluating the CCT, this approach should not be undertaken. If the intent is to evaluate lead exposure, a water sample must be only a part of a home's evaluation.
- A household action level is a good idea but that level must be set based on scientific data. Moving from a measure of the effectiveness of corrosion control treatment to determining the appropriate Health Action Level would provide focus for appropriate remedial actions and investments.
- A screen for determining if a supply's water is aggressive to copper and subsequent action by the water supply is a great idea if the screen is based on available science. Having separate sampling sites

appears at this stage to be premature and more data is needed to provide input. For example, is there something being done to impact the copper results with current sampling?

<u>Public Communications</u>

MI-AWWA recognizes the importance of regular and transparent communication that helps customers address risks from lead in drinking water. In addition to required language in consumer confidence reports, our members are taking other actions such as:

- Explaining what is known about the existence of lead service lines in the service area.
- Guidance on how to have water tested in the home, including free or low cost testing done by the local water supply.
- Discussion of how to identify and remove lead service lines, including financial assistance that may be available to them through the water supply.

Responses to the evaluation document

- Ongoing outreach could have the potential to motivate property owners to replace their lead service lines if the water supply has the resources to develop or acquire clear and consistent education materials offered in multiple languages and media. EPA could assist in this regard by providing such materials.
- Water supplies should notify home owners of an action level exceedance but 24 hours is simply too short a timeframe. Although well intended, 24 hours may not be practical. There is also concern that a 24-hour notice timeframe may be perceived as a health emergency. MI-AWWA suggests that three days may be a more reasonable timeframe.
- Although not opposed, MI-AWWA doesn't see the benefit in making the results of the water quality parameter monitoring accessible to the public. Much of this information would not be understandable to the layperson and could be misinterpreted. Also, we have concerns about protecting a property owner's rights to privacy particularly with information they believe others may construe as devaluing their property.

We encourage the development of a national clearinghouse of information on lead to help water systems and other entities communicate effectively and consistently about lead risks across all media.

We hope that our comments help EPA develop sound rule options that further reduce risk posed by lead, recognizing the realities of local budgets and infrastructure renewal needs. If EPA has any questions regarding these comments, please contact me at christine.spitzley@ohm-advisors.com or our Executive Director Bonnifer Ballard at bballard@mi-water.org.

Sincerely,

Christine V. Spitzley

Christine Spitzley
Chair, Board of Trustees

cc: David Ross, Assistant Administrator for Water, EPA

// WATERWORKS DEPARTMENT

CITY OF NEWPORT NEWS

OFFICE OF THE DIRECTOR
700 TOWN CENTER DRIVE, SUITE 500
NEWPORT NEWS, VIRGINIA 23606
(757) 926-1146
(757) 926-1170 FAX

March 7, 2018

Peter C. Grevatt, Ph.D.
Director
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N. W. *Mail Code:* 4601M
Washington, DC 20460

RE: Long-Term Lead and Copper Rule Federalism Consultation
(Docket ID No. EPA-HQ-OW-2018-0007)

Dear Dr. Grevatt:

The City of Newport News Waterworks Department appreciates the opportunity to offer comments to the U.S. Environmental Protection Agency (EPA) as part of its federalism consultation on potential long-term revisions to the Lead and Copper Rule (LCR). Our system is a member of the American Water Works Association, a participating association in this federalism consultation, hence our submittal.

Newport News Waterworks is committed to protecting consumers of drinking water from exposure to lead. Improving the LCR to further reduce exposure to lead requires community-specific solutions that recognize the shared responsibility between consumers and water systems for managing exposure to lead in drinking water. We also recognize the importance of federal, state, and community-wide investment in managing lead exposure from multiple sources: lead paint in housing, lead deposited in soils, sources of lead in schools, lead in other household items, and lead in drinking water.

As EPA contemplates improvements to the Long-Term Lead and Copper Rule, Newport News Waterworks encourages a focus on actions that are feasible within current statutes so that we can move forward without confusion and additional delay. It also is critical that any requirement to change water chemistry provides flexibility to address local water quality and operational considerations. A federal rule that requires all water systems to use the same corrosion control treatment would be problematic.

We hope that our observations assist in developing a protective rule within available resources while avoiding unintended consequences.

Lead Gooseneck Replacement

We are evaluating implementation of a full lead gooseneck replacement strategy in our service area. Our current estimate is that there are *3,000* lead goosenecks in our system, a reduction from *8,000* thirty years ago. We have identified the following challenges in our efforts to remove them:

- Limited information on the pipe material in use on each customer's property.
- Customers who are unwilling to replace service lines or unable to afford the cost of service line replacement.
- Replacement projects require coordination in order to minimize disruption to our community.

With these challenges in mind:

- Newport News Waterworks has funding in its capital improvements program to replace all lead goosenecks over a ten year period.
- We are committed to establishing an inventory of lead goosenecks. Waterworks has scrubbed its GIS data and pipe inventory in concert with empirical/observational data gathered from routine field work to improve our count and system-wide accuracy. Currently, through our capital project planning, we anticipate that all lead goosenecks will be replaced in 10 years or sooner provided no unanticipated issues arise.

Optimized Corrosion Control

The Newport News Waterworks Department has employed pH control and zinc orthophosphate treatment since 1992 and has never exceeded the lead or copper action level. This successful strategy has used a dose of approximately 0.2 mg/l as P or 0.6 mg/l as PO_4. Waterworks sees no advantage to a higher phosphate dose given its extremely low levels of lead detected and the negative impacts on the wastewater treatment process and the environment would exceed any benefits.

Public Communications

Newport News Waterworks recognizes the importance of regular and transparent communication that helps customers address risks from lead in drinking water.

In addition to required language in consumer confidence reports:

- Waterworks promptly notifies all customers of their lead testing results at their homes and/or businesses.
- Waterworks and the Virginia Department of Health provide steps customers can take to protect themselves from lead at the tap.
- Waterworks provides guidance on how to have water tested in the home.
- Results of testing for the lead and copper rule are available on the Waterworks web page.

The Newport News Waterworks Department encourages the development of a national clearinghouse of information on lead to help water systems and other entities communicate effectively about lead risks across all media.

We hope our comments help the EPA develop sound rule options that further reduce risk posed by lead, recognizing the realities of local budgets and infrastructure renewal needs.

Enclosed is a brief summary about the Newport News Waterworks system.

If the EPA has any questions regarding these comments, please contact me at (757) 926-1144 or via e-mail at lmartinez@nnva.gov.

Best regards,

Louis Martinez

Louis Martinez
Director

LM/MLH/sjth

Enclosure

sc: David Ross, Assistant Administrator for the Office of Water

Summary of
Newport News Waterworks System

General Description

The City of Newport News Waterworks Department serves approximately 420,000 customers and is predominately a surface water system. The median household income in our service area is somewhat below the national average.

Meeting the Current LCR

Currently, our system's average lead level is below the detection level, as is our 90th percentile reading. We achieve these low levels by pH control and zinc orthophosphate treatment.

Current Investments in Infrastructure

Revision of the LCR is coming at a time when our system has recently completed $100 million dollars in capital projects over the last five years and Waterworks expects to invest $100 million more in the next five years. These improvements are being funded through water rates and fees. Over the last five years water rates have increased *15* percent to finance these improvements.

CITY OF SOUTH BEND PETE BUTTIGIEG, MAYOR
DEPARTMENT OF PUBLIC WORKS
Eric Horvath, Director

March 5, 2018

RE: Long-Term Lead and Copper Rule Federalism Consultation
(Docket ID No. EPA-HQ-OW-2018-0007)

To whom it may concern,

I am writing as the Director of Water Quality for South Bend Water Works. Our utility is dedicated to providing the best quality of water possible to our customers, which includes protecting them from exposure to lead from drinking water. We agree that the Lead and Copper Rule needs revisions, but would like to share our comments based on the January 8th Federalism Consultation Meeting. Please consider my utility's comments on the potential long-term revisions to the Lead and Copper Rule.

Key Areas for Rule Revisions

Lead Service Line Replacement

- *Require systems to create an inventory of lead service lines –*
We have estimated that our system has 24,000 lead service lines (>50%) based on the age of the home. There are not adequate records to say the material of the pipe with certainty. We currently verify the service line material when repairs are done to the line through our insurance program, but will obviously not touch every line. Would an estimate fulfill this requirement or would we need to actually dig into everyone's yard to verify the material? Verification would be costly and would lead to unhappy customers.

- *Require proactive full lead service line replacement on a specified schedule (e.g., 10, 15, 25, 35 years from promulgation) –*
In our community, the entire service line is the property of the homeowner. We do not have the funding to replace these lines, nor can we freely use public funds to benefit private property owners. Our community also has a large percentage of the population living near or below the poverty level, so they would not be able to afford the replacement. In fact, the cost of the line replacement would at times be more than the value of the home. In addition, most of our consumers are not concerned about lead in the drinking water since we have always been in compliance with the LCR. Their main priority has been dealing with lead paint issues.

- *Allow partial LSLR only for emergency repair or "unwilling or unable customers" when conducting infrastructure replacement (e.g., main replacement)*
Where there are lead service lines in our community, only one portion of the line is lead. We have heard that galvanized pipe can cause issues as well after a LSLR and believe that the entire

line should be replaced in these cases if a partial is being done. We do wish that we could do a full line replacement when a LSL is in need of an emergency repair, but generally the customer would be unwilling or unable to pay for this. In addition, many of the actual homeowners do not live in our community. Some live in foreign countries. Protecting the actual residents may be another hurdle for this reason.

- *Require pitcher filters to be distributed and regularly maintained by the PWS for three months immediately following lead service replacement*
  This seems like a great idea, but where would the funding come from? Not only would the funding for the pitchers and the filters be needed, but additional staff would also be necessary to tackle this task.

Corrosion Control Treatment

- *Require systems with lead service lines (regardless of population served) to install and maintain CCT?*
  South Bend Water Works has very hard water with an average level of hardness as calcium carbonate of 364 ppm, an average alkalinity as calcium carbonate of 279 ppm, and an average pH of 7.5. These water quality parameters have been deemed adequate to prevent corrosion of pipes under normal circumstances. Should it be necessary to pay for this treatment for water that does not show signs of corrosivity? We currently use a polyphosphate at some of our treatment plants for iron and manganese sequestration. Would a change in treatment chemicals make it difficult to keep these metals in suspension? In addition, our wastewater treatment plant currently has to use a chemical to remove phosphorous and application of phosphorous to farm fields is likely to become an issue. If the chemical required is a phosphate and it must be used at all treatment plants, how would this affect our wastewater plant?

- *Require plumbed in point of use treatment devices to be provided to households with lead service lines and regularly maintained*
  As mentioned with the three month requirement after a LSLR, this would require even more funding and additional staff to keep this organized. Maintaining the devices would be particularly challenging.

- *Prescribe a default CCT that must be maintained unless a system can demonstrate equivalent CCT to the state, or require the system to conduct a periodic re-evaluation of CCT to be reviewed by the state?*
  We believe a periodic re-evaluation of corrosion control is a good idea.

- *Require system to find and fix problems in corrosion control treatment if a tap sample exceeds an action level?*
  We currently resample at locations that have tap results above the action level and provide some guidance, but we feel it is the homeowner's responsibility to manage their own plumbing. Often, when a tap sample exceeds an action level it is because the customer took a sample from a faucet that has not been used for months or the sample was taken after water softener treatment. We encourage our residents to not over-soften their water by setting their softener

on the low side of the scale and to increase only if they feel it is not doing an adequate job. However, as stated above, our water is very hard and we have not found a lot of guidance literature on how to use a softener to maintain a level of hardness that is acceptable to consumers but will not cause any corrosion to their plumbing. In addition, this may consume a lot of time trying to pinpoint an issue in someone's home.

Tap Sampling

- *Changing where water systems are required to collect tap samples - At sites based on customer request or at schools served by the system*
  We currently provide free lead testing to those requesting it, but only had 38 total requests in all of 2017. In fact, when we did our compliance sampling in 2016, we sent out 378 surveys to homes we believed had a LSL and/or lead plumbing. Only 95 of the surveys were returned by customers, of which only 65 qualified as a Tier 1 site or were interested in participating.
  We provided our schools with guidance on sampling, but if we followed the 3 Ts, it would be extremely costly for us. Our state is currently providing funding for public schools on a volunteer basis, but private schools are not included. Where do they fit in? There are at least 54 schools on our city water.

- *Change the way samples are collected to be more representative of exposure - Increase the number of samples required or instruct consumers to sample when they are drawing water for drinking or cooking.*
  We believe that having customers take samples when they are drawing water for drinking or cooking would give a more accurate portrayal of the exposure they are getting. We also believe that one sample is not necessarily indicative of the situation at all times. Although it would be more costly, we believe more than one sample taken at different times would likely be more representative.

- *Establish a household action level that if exceeded would trigger a report to the consumer and to the applicable health agency for follow up*
  This is an excellent idea. It is difficult to explain the current action level to residents. It is also difficult to answer their questions when lead is detected at their tap, but below the AL.

Public Education and Transparency

- *What do state and local governments think are the most effective ways for water systems to deliver educational information to consumers?*
  South Bend Water Works firmly believes in providing education to our residents on ways to minimize their exposure to lead in drinking water. In April of 2017, we sent all residential customers a "Homeowner Guide to Managing Lead in Drinking Water" in their water bills. It is also posted on our website. The guide explains the health effects of lead, lists potential sources of lead that may come into contact with their drinking water, and gives tips on how to reduce their exposure.

- *Water systems to provide on-going targeted outreach with a special emphasis on all customers with lead service lines*

We agree that this is a good idea as well. While all bill receiving residents received our homeowner guide, we also provide a door hanger to customers having emergency repair done on their service lines that we believe may possibly contain lead. The hang tag explains that a disruption to the service line could cause an increase of lead in their drinking water for six months. It gives tips on how to reduce exposure including flushing and purchasing a filter certified to remove lead. We do not provide the filters, but do provide the education.

- *Water systems to provide notification to consumers within 24 hours of exceeding an action level (as required by the 2016 WIIN Act)*
  We believe it is important to notify consumers at a higher risk of exposure within 24 hours of obtaining the results. In our last sampling event, we attempted to mail letters to the residents within 24 hours, even with low or non-detect results. In addition, we called the two residents that had results above the action level.

- *Water Systems to make information accessible to consumers on results of all tap sampling, results of water quality parameter (WQP) monitoring and the number and locations of LSLs*
  This requirement is acceptable as long as the location of the sample taken remains confidential for the resident.

Copper Requirements

- *Establish a screen to determine if water systems have water aggressive to copper – If water is aggressive, require: – monitoring and/or – public education and/or – CCT.*
  South Bend Water Works agrees that the current LCR is geared toward lead and may not adequately measure exposure to copper. An established screen would be great guidance and monitoring, education, and/or CCT should be required if the water is aggressive to copper.

- *Modify tap sampling to require separate sampling sites for copper*
  As mentioned above, we believe the current LCR is not necessarily measuring exposure to copper and that different sampling sites would be required to do this adequately.

South Bend Water Works appreciates the opportunity to provide comments on the proposed changes to the Lead and Copper Rule. Please take our comments into consideration when determining the final rule language.

Regards,

Michelle Smith

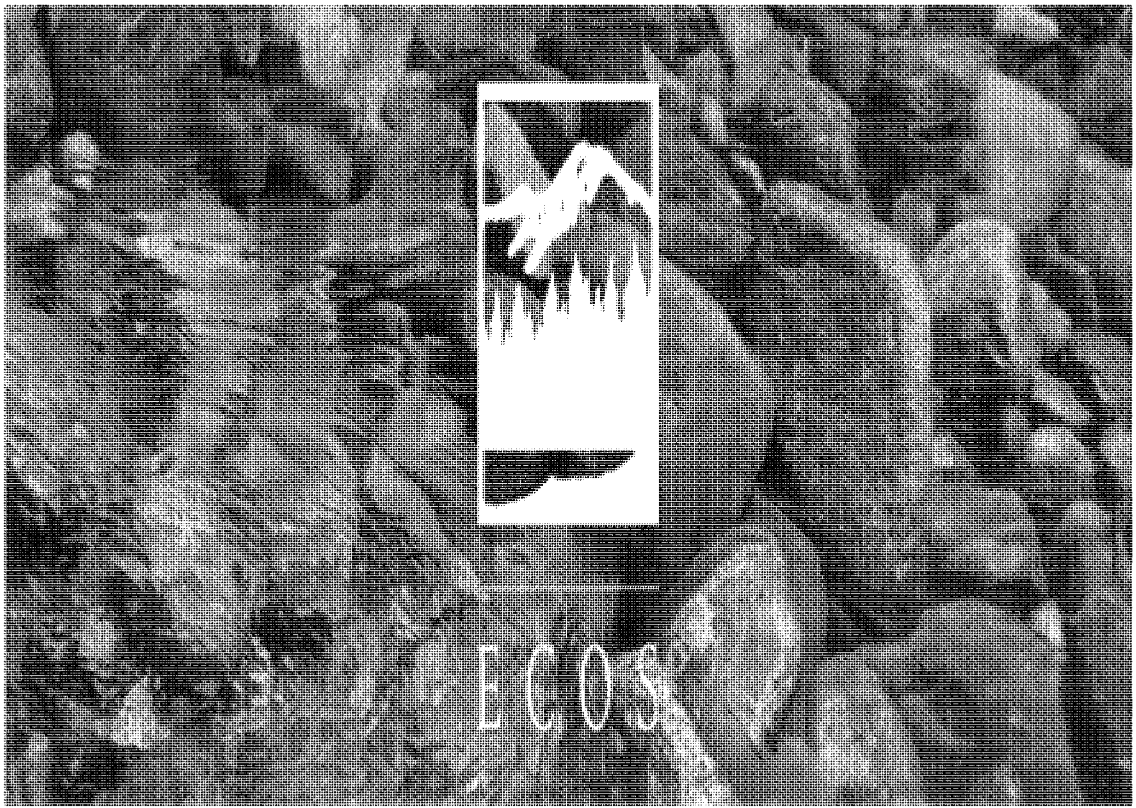
Michelle Smith
Director of Water Quality
South Bend Water Works, PWSID IN 5271014
830 N Michigan St.
South Bend, IN 46601

Message

From: ECOS [ecos@ecos.org]
Sent: 2/21/2020 4:15:31 PM
To: Fotouhi, David [Fotouhi.David@epa.gov]
Subject: U.S. EPA Proposes to Regulate PFAS in Drinking Water, Provide Flexibility on Coal Ash Liners

U.S. EPA Proposes to Regulate PFAS in Drinking Water, Provide Flexibility on Coal Ash Liners

ECOSWIRE | Vol. 22 No. 7 View this email in your browser



ECOSWIRE

Friday, February 21, 2020

Vol. 22 No. 7

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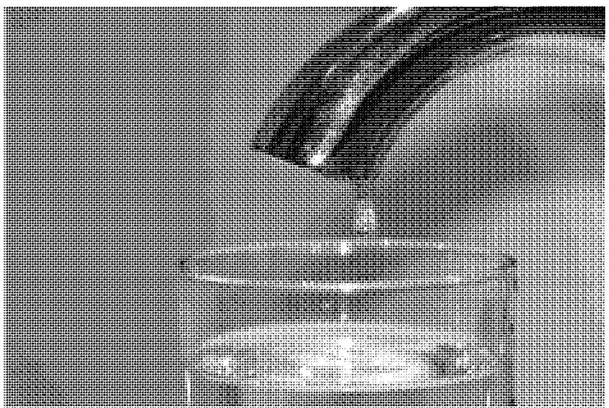
In Rare SDWA Step, U.S. EPA Proposes to Regulate PFOA and PFOS in Drinking Water



U.S. EPA yesterday announced its proposed decision to regulate PFOA and PFOS in drinking water. The long-awaited regulatory determination, as outlined in the agency's PFAS Action Plan, marks a rare move for setting standards for pollutants that meet Safe Drinking Water Act (SDWA) criteria. In early December, EPA sent its preliminary determinations to the Office of Management and Budget for interagency review.

The agency is also seeking public comment on eight contaminants to be listed on the fourth Contaminant Candidate List and is gathering information to determine if regulation is appropriate for other PFAS chemicals. Every five years, EPA must publish a list of contaminants (Contaminant Candidate List, CCL) that are known or anticipated to occur in public water systems and are not currently subject to drinking water regulations. Following public comment and CCL finalization, EPA determines whether or not to regulate these chemicals. According to *Inside EPA*, the proposed decision to regulate PFOA and PFOS is only the second time the agency has decided to regulate pollutants under the 1996-amended SDWA.

Additionally, the agency proposed regulations on imported products that contain certain persistent long-chain PFAS that are used in surface coatings, which can apply to items like furniture, household appliances, automobile parts, and electronics. The amended Toxic Substances Control Act provides EPA the authority to regulate products imported as a component of other products. Though the agency believes these materials are largely phased out from import, this clarification to the significant new use rule will ensure that the agency reviews any imported goods with PFAS used in surface coatings and provide EPA authority to restrict product imports if it finds potential unreasonable risks. EPA will accept public comments on this proposal for 45 days in docket EPA-HQ-OPPT-2013-0225 on www.regulations.gov. For more information, see here. [Longsworth]

U.S. EPA Provides Flexibility on Liners in Latest Coal Ash Proposal

On February 19, U.S. EPA announced additional proposed revisions and flexibilities to the regulations for the management of coal combustion residuals (CCR) – or coal ash – from electric utilities.

The proposal is the last in a set of four revisions to the 2015 rules that the agency is taking under the Trump Administration. EPA says the "common-sense changes" will provide the flexibilities owners and operators need to determine the most appropriate way to manage CCR and the closure of units based on site-specific conditions.

The latest proposal follows on the heels of others that implement the Water Infrastructure Improvements for the Nation Act, respond to petitions, address litigation, and aim to promote smooth implementation of the rule. It proposes four main changes:

- Procedures to allow a limited number of facilities to demonstrate to EPA that, based on groundwater data and the design of a particular surface impoundment, the unit has the equivalent protection from impacts on groundwater as provided by the composite liner system standards.
- A modification to closure requirements for units that are unable to complete groundwater remediation by the time all other closure by removal activities have been completed. Under this new provision, groundwater remediation must continue until groundwater protection standards are achieved during a post-closure period.
- An amendment to the notification of intent to close requirement designed to increase transparency.
- Conditions under which coal ash can be used in the closure of landfills and surface impoundments.

EPA will accept public comment on the proposal during a 45-day period, during which a public hearing will be held. For more information, see here. [Parisien]

U.S. EPA Issues Guidance on NSR Plantwide Applicability Limitation Provisions

U.S. EPA has released draft guidance on Plantwide Applicability Limitation (PAL) Provisions Under the New Source Review (NSR) Regulations. PAL permits set plantwide emissions limits for regulated pollutants under the NSR program, providing flexibility by allowing operators in some cases to avoid having to determine whether upgrades or other projects require an NSR permit related to an expected increase in emissions. The draft guidance addresses various elements of the program in order to respond to concerns and improve understanding.

Comments are due **March 16**. [Poole]

ECOS Calls for State Environmental Agency Budget Information

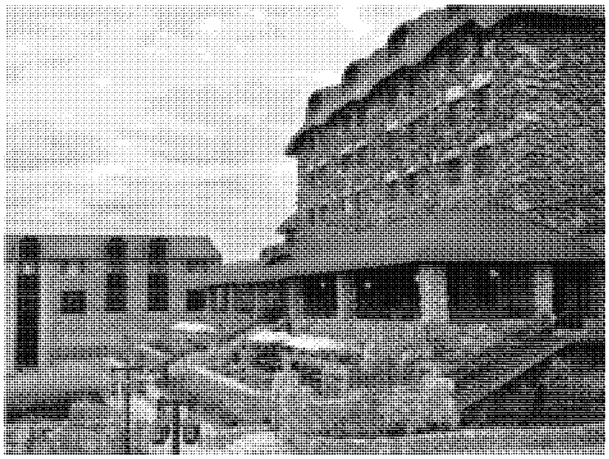
On February 19, ECOS issued surveys requesting states' assistance in updating information on environmental agency budgets for FY16-19. This work builds on an ECOS budget request in July 2016 for similar information (see ECOS *Green Report* entitled *Status of State Environmental Agency Budgets 2013-2015*). ECOS is seeking to update this information to reflect fiscal year budgets since 2015.

The budget information from this request will be used to reevaluate trends in the amount and composition of state environmental agency budgets. These findings will shed light on the importance of federal funding support and assist ECOS in identifying key future areas of concern to states.

ECOS also published similar green reports in 2012 for FY11-13 and in 2010 for FY09-11.

Please submit information by **March 11** to Beth Graves and Andrew Pratt of ECOS. Thank you to the states (Kansas, Louisiana, New Hampshire, and Oklahoma) that have already returned their completed surveys! [Graves/Pratt]

Make Your Spring Meeting Reservation by February 28 at the Omni Grove Park Inn



Have you saved your spot in Asheville, North Carolina for the ECOS Spring Meeting on *2020 Vision for the Environment*?

If not, make your hotel reservation at the Omni Grove Park Inn before the special group rate expires **February 28 (or sooner in the event of sellout)**. Also, register for the meeting at the regular rate by **March 13**.

Don't miss this chance to hear compelling keynotes from:

- North Carolina Department of Environmental Quality Secretary **Michael Regan** on his state's vision for a sustainable future;
- *New York Times* bestselling author **Seth M. Siegel** on fixing the nation's drinking water; and
- World Resources Institute Senior Fellow **Karl Hausker** on the transition to clean energy.

Rounding out the program are sessions spotlighting challenges and successes on everything from PFAS to plastics. You can also take part in virtual reality demonstrations and a celebration of Earth Day's 50th anniversary.

See the draft agenda and other meeting information here. For agenda and sponsorship information, contact Lia Parisien. For registration information, contact Paulina Lopez-Santos. For hotel information, contact Layne Piper. [Parisien]

State News You Can Use

Attention, New York Shoppers: BYOB (Bring Your Own Bag!)

California Tells EJ Story with New Visual Tool

When Bourbon Leaves the Barrel: Kentucky Reflects on Major Spill Response

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Need-to-Know News in Chemicals and Emerging Contaminants, Air, & Water

U.S. EPA Finalizes Low-Priority Chemical List under TSCA

Area of Focus: *Chemicals and Emerging Contaminants*

U.S. EPA this week published its list of 20 chemical substances identified as low-priority for risk evaluations under the amended Toxic Substances Control Act (TSCA). This action marks the completion of another TSCA requirement and helps the agency narrow down its long list of chemicals in order to focus its risk evaluation efforts on those that could significantly impact public health and the environment.

EPA designated 20 chemicals as high-priority under TSCA in December, and those chemicals are currently undergoing risk evaluation. See more here. [Longsworth]

2019 Power Plant Emission Data Show Drop in Key Emissions

Area of Focus: *Air*

U.S. EPA has released preliminary data on 2019 emissions of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon dioxide (CO_2), and mercury (Hg) from power plants in the lower 48 states. These data show a decline in overall emissions of these pollutants compared to 2018.

The annual data point to a 14% decline in NOx emissions compared to 2018, a 23% decline in SO2 emissions, an 8% decline in CO2 emissions, and a 13% decrease in Hg emissions. In addition, ozone season NOx emissions reportedly dropped 13%. During this time period, electric generation from these power plants decreased by 3%.

EPA notes that annual emissions of SO2 from the power sector are below 1 million tons for the first time in modern history.

While there has been a 13% drop in Hg emissions, the White House Office of Information and Regulatory Affairs is still considering EPA's proposal to revoke its 2012 determination that it was "appropriate and necessary" to curb releases of mercury, arsenic, and other hazardous air pollutants from coal- and oil-fired power plants. [Poole]

U.S. EPA Produces Video Series on Low-Cost Air Quality Sensors

Area of Focus: *Air*

U.S. EPA has developed an air sensors educational video series, both in English and Spanish. The videos can be used to learn how EPA collects and uses air quality data, how air quality health risks are communicated, and how to interpret data collected using air sensors.

Many people look for credible air quality information to help reduce the risk from air pollution and to protect public health in their communities. Air sensors are usually lower in cost, portable, and generally easier to operate than the regulatory-grade air pollution monitors used in the United States to understand air quality conditions.

With increased availability of air sensors, thousands are now in use by individuals, community groups, health organizations, and others. The popularity of these devices, however, has resulted in many questions about how to use and communicate the sensor data collected during monitoring. The videos offer information to address common questions about these devices. [Poole]

U.S. EPA Announces Funding to Further Reduce Lead in Drinking Water

Area of Focus: *Water*

This week, U.S. EPA announced the availability of approximately $40 million to assist disadvantaged communities and schools with removing sources of lead in drinking water. The funding, authorized under the Water Infrastructure Improvements for the Nation (WIIN) Act, will be directed to schools and disadvantaged communities and will help support public health and economic potential.

More than $17 million is available for projects that implement or improve corrosion control or conduct lead service line replacements in disadvantaged communities, and $22.8 million is available for projects that remove sources of lead in drinking water (e.g., fixtures, fountains, outlets and plumbing materials) in schools or child care facilities.

EPA is prioritizing projects for drinking water systems that service disadvantaged communities, including those that are part of qualified Opportunity Zones, and that have exceeded the lead action level during the last three years.

This WIIN grant will be competed through a Request for Application process. The funding opportunity will remain open for 60 days on www.grants.gov. Learn more about this grant and EPA's other WIIN grant programs here. [Piper]

Upcoming Events

U.S. EPA on Small Drinking Water Systems Risk Assessment

As part of a monthly series on challenges and treatment solutions for small drinking water and wastewater systems, U.S. EPA is hosting a webinar on Drinking Water Tools for Small Systems on **February 25 at 2-3 p.m. Eastern**.

Please register here. [Piper]

ASDWA on Lead & Copper Rule Revisions Comment Review

The Association of State Drinking Water Administrators (ASDWA) will hold a states-only webinar on **February 27 at 12-1 p.m. Eastern** to review U.S. EPA's proposed Lead & Copper Rule Revisions (LCRR). The revisions, proposed November 13, ultimately will be a significant update of the 1991 Lead and Copper Rule (LCR) that will affect implementation for all states and territories.

This webinar will help states and territories better understand the proposed revisions and the potential ramifications to drinking water programs. Through the ASDWA LCRR Workgroup and the ASDWA Board, extensive comments were developed on the proposed LCRR.

The webinar will summarize the proposed LCRR, as well as ASDWA'S comments on the proposal. ECOS comments on the proposed revisions are available here.

Register here. [Piper]

ITRC on Issues and Options in Human Health Risk Assessment

ITRC will hold an online training course on *Issues and Options in Human Health Risk Assessment* on **February 27 at 1-3:15 p.m. Eastern.**

Regulatory project managers and decision-makers may not have specific guidance when alternative approaches, scenarios, and parameters are proposed for site-specific risk assessments, and are faced with difficult technical issues when evaluating these site-specific risk assessments. This training course and associated guidance document are resources for evaluating alternatives.

Register here. [Olonoff]

U.S. EPA on Disaster Debris

U.S. EPA will host a webinar on **March 5 at 1-2 p.m. Eastern** to explore lessons learned from two innovative projects following Hurricanes Katrina and Irene. Both projects aimed to ensure more resilient futures through disaster debris reduction, job creation, and community reconstruction. The webinar will highlight pre-disaster and resilience planning strategies as well as recovery efforts.

Register here. [Longsworth]

ITRC on Groundwater Statistics for Environmental Project Managers

ITRC will hold an online training course on *Groundwater Statistics for Environmental Project Managers* on **March 5 at 1-3:15 p.m. Eastern**.

Statistical techniques may be used throughout the process of cleaning up contaminated groundwater, but it can be challenging for practitioners who are not experts in statistics to interpret and use statistical techniques. The training class will encourage and support project managers and others who are not statisticians to: use the ITRC guidance document on *Groundwater Statistics and Monitoring Compliance* to make better decisions for projects; apply key aspects of the statistical approach to groundwater data; and answer common questions on background, compliance, trend analysis, and monitoring optimization.

Register here. [Olonoff]

Visit ECOS.org

Our mailing address is:
Environmental Council of the States
1250 H St NW Ste 850
Washington, DC 20005-3951

Message

From: Grevatt, Peter [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D3CAA0C39EBE44CB9D3AE44DA7543733-GREVATT, PETER]
Sent: 4/10/2014 1:19:28 PM
To: Alan Roberson [ARoberson@awwa.org]; Burneson, Eric [Burneson.Eric@epa.gov]; Bergman, Ronald [Bergman.Ronald@epa.gov]
CC: Becki Clark [Clark.Becki@epa.gov]; Lopez-Carbo, Maria [lopez-carbo.maria@epa.gov]; Eric Bissonette (Bissonette.Eric@epa.gov) [Bissonette.Eric@epa.gov]; Paula Mason (Mason.Paula@epa.gov) [Mason.Paula@epa.gov]
Subject: RE: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments

Sounds good Alan. I'll ask Paula Mason to reach out to you to schedule a time. Thanks!

From: Alan Roberson [mailto:ARoberson@awwa.org]
Sent: Wednesday, April 09, 2014 8:45 PM
To: Grevatt, Peter; Burneson, Eric; Bergman, Ronald
Subject: Fwd: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments

Peter and Eric and Ron, we should probably talk soon about the updates the Deputy Administrator has been talking about as we have some ideas. I am out of pocket for a bit but open the week of April 21. Alan

Sent from my iPhone

Begin forwarded message:

> **From:** Tommy Holmes <THolmes@awwa.org>
> **Date:** April 9, 2014 at 2:39:33 PM MDT
> **To:** Alan Roberson <ARoberson@awwa.org>, Steve Via <SVia@awwa.org>, Tom Curtis <TCurtis@awwa.org>, Kevin Morley <KMorley@awwa.org>, Adam Carpenter <acarpenter@awwa.org>
> **Subject: FW: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments**
>
> --
> From: BNA Highlights[SMTP:BHIGHLIG@BNA.COM]
> Sent: Wednesday, April 09, 2014 2:40:23 PM
> To: Tommy Holmes
> Subject: Apr 9 -- BNA, Inc. Daily Environment Report - Latest Developments
> Auto forwarded by a Rule
>
> Manage your email subscriptions
> Email not displaying correctly? View publication in your browser.

Latest Developments

EPA 'Likely' to Issue Final RFS in June, McCarthy Says

Posted April 09, 2014, 10:42 A.M. ET

Environmental Protection Agency Administrator Gina McCarthy tells a Senate Appropriations subcommittee April 9 that the agency will "likely" issue a final 2014 renewable fuel standard in June.

"It should never go beyond that," McCarthy said, adding she hopes the agency can propose the annual targets more quickly in the future.

In November, the EPA proposed requiring petroleum refiners and importers to blend 15.21 billion gallons of renewable fuels in 2014, substantially less than the 18.15 billion gallons Congress mandated under the 2007 Energy Independence and Security Act.

EPA Official Urges Localities to Update Source Water Plans

Posted April 09, 2014, 4:06 P.M. ET

In light of the chemical spill in West Virginia's Elk River, the second ranking Environmental Protection Agency official said publicly owned drinking water utilities ought to begin updating their source water protection plans to be prepared to deal with threats to drinking water supplies.

At the National Clean Water Policy Forum, EPA Deputy Administrator Bob Perciasepe said source water protection plans, which should have been completed by 2003, have not been updated since then. "I mentioned this to drinking water folks earlier this week and I'll reiterate it here that it's not a bad time now to take those off the shelf and take a look at them to see what has been done and what hasn't been implemented and what's missing."

Source water constitutes from rivers, streams, reservoirs and aquifers that is treated and used for drinking water purposes. Under the Safe Drinking Water Act, states are required to develop and implement source water assessment plans. This is a process for evaluating a public water system's source water and assessing its vulnerability to contamination. Based on the information in the assessment, utilities develop plans to assess those risks. Utilities are under no obligation, however, to implement those plans.

Without naming Freedom Industries, Perciasepe said the facility that was the source of the chemical that contaminated the drinking water supplies of Charleston residents was identified in West Virginia's 2003 source water protection plan.

Perciasepe said that "the preparedness part is as essential as the identifying part. We have learned that."

Existing Water Act Authorities Suffice for Stormwater: EPA Official

Posted April 09, 2014, 4:05 P.M. ET

The top ranking Environmental Protection Agency water official said April 9 that the agency decided to defer national stormwater rulemaking after recognizing that it has the existing authority and tools under the Clean Water Act to tackle the problem.

"The reason is because we feel like there is a lot of existing authority and tools to accomplish the same goals. We need to maximize what we can do by creating incentives," Nancy Stoner, EPA acting assistant administrator for water, said on the final day of the April 7-9 National Clean Water Policy Forum.

The agency had confirmed March 19 to Bloomberg BNA that it was deferring action on its rule to address stormwater from newly built and redeveloped sites and instead will provide incentives, technical assistance and other approaches for cities and towns to address it themselves.

EPA to Take a Year to Revise Lead-Copper Drinking Water Rule

Posted April 09, 2014, 4:12 P.M. ET

The Environmental Protection Agency plans to propose revisions to its 20-year-old lead-copper drinking water rule after an agency working group completes its deliberations, which should take "about a year," the agency's top drinking water official said April 9.

On the final day of the National Clean Water Policy Forum, Peter Grevatt, director of the Office of Groundwater and Drinking Water, said the revisions to the lead-copper drinking water rule would be issued following the deliberations of a work group that has been set up at the National Drinking Water Advisory Council.

Grevatt said the work group would be charged with looking at lead-sampling protocols and measures to replace lead service lines, among other issues.

He said there are 10 million lead service lines in the country. "It's a very expensive proposition to replace them all. The process is complicated because the lines are partly owned by utilities and partly owned by homeowners," he said.

The lead and copper rule requires drinking water utilities that have lead service lines and optimized corrosion control—but which still exceed the legal limit known as the "action level" for lead—to replace 7 percent of their lead service lines annually, replace the portion of the line that the system owns and offer to replace the customer's portion of the line at the customer's cost. A full line replacement would involve replacing the service lines from the water main to homes.

Final Clean Water Act Jurisdiction Rule Possible in 'About a Year' McCarthy Says

Posted April 09, 2014, 11:18 A.M. ET

Environmental Protection Agency Administrator Gina McCarthy says the agency will look to finalize a proposed rule clarifying its Clean Water Act jurisdiction in "about a year," but it will take "whatever time it takes to get this right."

The EPA will listen to comments and concerns about the proposed regulation, and it will consider rethinking language in the proposal to address those concerns.

McCarthy acknowledges there is significant distrust between the agricultural industry and the EPA about the proposed regulation, and she pledges to conduct significant outreach to address the industry's concerns.

"I really want this rule to work for the agriculture community," McCarthy tells a Senate Appropriations subcommittee during a hearing on the fiscal 2015 budget request for the EPA

The EPA and the U.S. Army Corps of Engineers issued the joint proposed rule on March 25.

Staff Cuts to Affect Technical Assistance, Grants, Perciasepe Says

Posted April 09, 2014, 3:18 P.M. ET

A reduced workforce at the Environmental Protection Agency owing to spending constraints will affect the level of grants and technical assistance that the agency can offer to states and localities, according to EPA Deputy Administrator Bob Perciasepe.

Speaking on the final day of the National Clean Water Policy Forum, Perciasepe said the agency is in the process of reducing its workforce by almost 2,000 people in response to budget constraints placed on its spending by Congress.

Most important, though, "all this will affect what kind of technical assistance we can give, what kind of state grants we can have, and what's going to happen to [state revolving funds]," Perciaspe said.

He said the EPA, which hasn't been immune to cuts in domestic discretionary spending, will have only so much money in discretionary federal spending. "We have to figure out the balance between different parts of it: the part that funds EPA's work, the part that funds grants for state operations, and the part that funds infrastructure and superfund so all of those are tight," he said.

House Transportation Passes Bill Limiting EPA Dredge-and-Fill Permit Authority

Posted April 09, 2014, 12:55 P.M. ET

The House Transportation and Infrastructure Committee passes a bill April 9 that would restrict the Environmental Protection Agency's ability to revoke a clean water dredge-and-fill permit after the U.S. Army Corps of Engineers has approved the permit.

The committee approved the bill (H.R. 524) on a 34-20 vote, largely along party lines with support from Republicans and some Democrats. Rep. David McKinley (R-W.Va.) and 10 co-sponsors introduced the bill Feb. 6.

Currently, the EPA may alter or revoke a dredge-and-fill permit at any time under Clean Water Act Section 404(c), even after the permit has been approved by the corps, if it determines the actions will cause unacceptable harm to the environment.

Potentially affected industries include construction, mining and agriculture, among others.

The EPA has revoked portions of a dredge-and-fill permit for a surface coal mine owned by Arch Coal Inc. in West Virginia. It also recently began the process under Section 404(c) to consider preemptively vetoing a Section-404 permit for the proposed Pebble Mine in Alaska, owned by Northern Dynasty Minerals Ltd.

DOT Plans to Set Minimum Crew Size for Crude Oil Trains

Posted April 09, 2014, 2:07 P.M. ET

The Federal Railroad Administration announced that it intends to propose minimum crew-size requirements for most mainline freight and passenger trains, including trains carrying crude oil.

The administration, in an April 9 statement, said that the proposed rule will likely require a minimum of two-person crews for trains carrying crude oil. The proposed rule also is expected to establish "appropriate" exceptions to the minimum crew-size requirements, according to the administration.

FRA Administrator Joseph Szabo said in an April 9 statement that the administration thinks the use of a multi-person train crew will enhance safety. "Ensuring that trains are adequately staffed for the type of service operated is a critically important to ensure safety redundancy," Szabo said.

Presently, FRA regulations do not include minimum crew-staffing requirements, but the current rail industry practice is to have two-person crews, according to the administration.

The safety of transporting crude oil by rail has been a priority for the Transportation Department, which is also considering new tank-car standards for cars in flammable liquid service.

A July 2013 derailment of an unattended train carrying crude oil in Lac-Mégantic, Quebec resulted in the deaths of 47 people.

DOT's Foxx Says Lack of Oil Industry Data Slowing Rail Safety Efforts

Posted April 09, 2014, 11:40 A.M. ET

Transportation Secretary Anthony Foxx told a Senate Appropriations subcommittee April 9 that the failure of the oil industry to respond to a request for data on the characteristics of crude oil from North Dakota's Bakken shale region is slowing down efforts to improve the transport of crude oil by rail.

Foxx told the Subcommittee on Transportation, Housing and Urban Development and Related Agencies that the DOT has received information from three individual oil companies but has not received "robust" data from the oil industry, despite a January request for as much information as possible. Foxx noted that the department is conducting its own testing of Bakken crude samples, but said a larger number of samples would allow for a better assessment of crude oil characteristics.

The lack of data sharing is slowing down the DOT's ability to inform Congress on the volatility of Bakken crude oil and slowing down efforts to coordinate with emergency responders on crude-by-rail safety, according to Foxx. The Pipeline and Hazardous Materials Safety Administration issued a safety alert in January cautioning that crude oil from the Bakken region may be more flammable than other types of crude oil.

Foxx also said federal regulators need a "comprehensive understanding" of crude oil characteristics to develop new standards for rail tank cars that are used to transport flammable liquids. The DOT is working on a "complete and thorough" tank car rule that would address the design of new cars and the safety of existing DOT-111 rail tank cars.

"It all starts with knowing what we're transporting," Foxx said.

Foxx said his target date for issuing a proposed tank car rule is "as soon as possible" but declined to provide a more specific timeline when asked by Subcommittee Chairwoman Patty Murray (D-Wash.) and Subcommittee Ranking Member Susan Collins (R-Maine).

Companies involved in Bakken: Marathon Oil Corp., ConocoPhillips Co. and Whiting Petroleum.

Murkowski: EPA Regulations Could Fundamentally Change Economy

Posted April 09, 2014, 3:10 P.M. ET

At a Senate Appropriations subcommittee hearing today, Sen. Lisa Murkowski (R-Alaska) says forthcoming EPA regulations on carbon pollution from power plants could jeopardize the affordability and reliability of electricity in the United States.

Murkowski says the power plant regulations are part of a broader, troubling pattern of EPA actions that could "fundamentally change our economy and the lives of the people we are here to represent."

The Alaskan Republican, speaking to EPA Administrator Gina McCarthy, also expresses concern over the agency's recently proposed rule on Clean Water Act jurisdiction, which she says would drastically expand the lands subject to regulation.

Oil Industry Wants Biodiesel 'Loophole' Closed in Fuel Credits Rule

Posted April 09, 2014, 2:37 P.M. ET

Allowing biodiesel producers to separate and sell renewable fuel credits creates more opportunities for fraud in the renewable identification number market, petroleum groups told the Environmental Protection Agency and White House during a recent meeting.

The American Petroleum Institute, American Fuel & Petrochemical Manufacturers and Exxon Mobil Corp. told the EPA and Office of Management and Budget to eliminate the ability of biodiesel producers to sever renewable identification numbers (RINs) from batches of fuels produced as part of an upcoming final rule establishing a quality assurance program for the fuels credit market. RINs are serial numbers attached to batches of renewable fuels that also can be severed and sold as credits to comply with the annual renewable fuel standard blending mandates.

"EPA must close the loophole for RIN separation, which has been the source of over 170 million fraudulent RINs. The volume of biodiesel used as neat transportation fuel is miniscule compared with the risk for RIN invalidity," the petroleum groups said in materials presented to the administration at the March 24 meeting.

However, biodiesel producers told the administration that it needs the revenue generated by selling its RINs during a separate March 24 meeting.

The EPA proposed the rule in February 2013. As proposed, it would establish qualifications for third-party auditors who would determine the validity of the renewable identification numbers (RINs)—serial numbers attached to batches of renewable fuels. It also would establish audit procedures for renewable fuel production facilities, including minimum frequency, site visits, review of records and reporting requirements.

As part of that proposed rule, the EPA is taking comment on whether renewable fuel producers should be allowed to separate and sell their own RINs. The EPA anticipates finalizing the rule in April.

Bill to Expedite LNG Exports Approved by House Panel

Posted April 09, 2014, 4:10 P.M. ET

A House Energy and Commerce subcommittee approves a bill (H.R. 6) April 9 that would automatically approve licenses to export natural gas to countries that are members of the World Trade Organization.

The Subcommittee on Energy and Power approves the bill on a 15-11 party-line vote and adopts one amendment from Rep. Bobby Rush (D-Ill.) on a voice vote. The Rush amendment would require the Department of Energy to disclose the specific destination of any liquefied natural gas exports.

Rush says consumers need to know whether natural gas exports actually reach Europe or will be sold to higher-priced markets in Asia.

Democrats say they plan to offer more amendments at the full committee markup, which will follow the two-week congressional spring recess. Those amendments will focus on the impacts to U.S. consumers and manufacturers of LNG exports, they say. No Democrats voted for the bill.

The Republican-sponsored bill also would approve the 24 LNG export license applications pending at the Energy Department. Rep. Cory Gardner (R-Colo.), the bill's sponsor, says the legislation is a response to calls for help from Eastern European countries that want to reduce their dependence on Russian oil and gas exports.

California Lawmakers Advance Bills on Fracking, Response Plan

Posted April 09, 2014, 4:21 P.M. ET

California's Senate Committee on Natural Resources and Water Quality April 8 advanced measures seeking to impose a moratorium on hydraulic fracturing activities at oil and gas fields and updates to the state's oil response program to address the risks of importing crude oil by rail.

Both bills now head to the Senate Committee on Environmental Committee for further action.

The measure to halt oil and gas well stimulation treatments, S.B. 1132, cleared the committee on a 5-2 vote.

S.B. 1132, however, did not have broad support from Democrats on the committee. Sen. Fran Pavley (D) provided the fifth vote needed to advance the bill that would ban oil and gas well stimulation activities throughout the state until a study can deem the activities safe for the public and environment.

Democrats, including Richard Lara, abstained from the vote, saying the measure would affect his constituents that work at oil and gas fields in Southern California.

If enacted, the measure would bar hydraulic fracturing, acidization treatments and other stimulation treatments used to improve mostly oil production in the state. Even if passed by the full Senate and Assembly, the fate of S.B. 1132 falls to Gov. Jerry Brown (D), who so far has not supported a moratorium on oil and gas well stimulation activities.

Guide Released to Improve 'Traceability' in Corporate Supply Chains

Posted April 09, 2014, 2:36 P.M. ET

The United Nations Global Compact and sustainability advisory group BSR released April 9 a guide to help companies improve "traceability" in their supply chains.

Currently, only a small percentage of commodities are traceable on sustainability issues, meaning companies can identify and track a product's path from raw material to finished good, the guide said. But traceability is becoming increasingly important to companies seeking to make their supply chains more transparent and meet their sustainability goals.

The guide uses examples of existing traceability systems for commodities such as biofuels, beef and palm oil to show companies which sustainability issues are relevant to each commodity and identify best practices in tracing it. Companies that are active in traceability efforts for those commodities include BP, McDonalds and Unilever.

NOAA Official: Right Economic Drivers Needed for Coastal Restoration

Posted April 09, 2014, 12:18 P.M. ET

The loss of coastal ecosystems is a problem that cannot be solved with government funding alone, a National Oceanic and Atmospheric Administration official said April 9.

"We have to get the economic drivers right" so that decision makers in the private sector, individual landowners and others consider the value of coastal ecosystem services in their investment decisions, Mark Schaefer, NOAA's deputy administrator, said during an event organized by the Center for American Progress and Oxfam America.

To help get those valuations right, Schaefer said decision makers need tools such as natural capital accounting that put a price on the benefits of coastal ecosystems. These ecosystems can provide benefits such as buffering storm surges, safeguarding coastal homes and businesses, and sequestering carbon.

EPA Seeks Advice on Applying Mixing Zone, Blending Policy Ruling

Posted April 09, 2014, 10:48 A.M. ET

The Environmental Protection Agency will use the latest scientific research to inform its decision on whether to relax nationwide policies on wastewater treatment practices during heavy rains in response to an appeals court ruling.

At the final day of the National Clean Water Policy forum today, Nancy Stoner, acting assistant administrator for water, said the EPA would publish a Federal Register notice to invite scientists to be on a panel that would advise the agency on whether public health would be served in applying nationwide a 2013 ruling handed down by U.S. Court of Appeals for the Eighth Circuit in Iowa League of Cities v. EPA.

In that decision, the Eighth Circuit rendered invalid the EPA's policies banning bacteria mixing zones in receiving water used primarily for recreational activities such as swimming, as well as the practice of blending partially and fully treated wastewater inside the treatment plants prior to discharge into nearby waters. The ruling also declared the ban on blending practices to be illegal under the Clean Water Act.

EPA was asked by representatives of the U.S. Conference of Mayors, the National League of Cities, the National Association of Counties, the International Municipal Lawyers Association and the National Association of Clean Water Agencies, which represents publicly owned municipal wastewater treatment plants, in November to end regulatory confusion by applying the appellate decision nationwide.

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service.

Message

From: Nathan Ohle [nohle@rcap.org]
Sent: 3/29/2018 9:07:27 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: New EPA Small System & Lead Grant Programs funded under latest FY18 Omnibus
Attachments: Water and Lead Grant Program Sections-WIIN Act of 2016.docx

Importance: High

Peter,

Can we meet to talk about these sometime soon? Please let me know some dates/times that might work. Thanks!

Nathan Ohle
Executive Director
RCAP, Inc.
(202) 470-1583

From: Ted Stiger
Sent: Monday, March 26, 2018 7:35 PM
To: Ted Stiger <tstiger@rcap.org>
Subject: New EPA Small System & Lead Grant Programs funded under latest FY18 Omnibus
Importance: High

Hi all,

The recent FY2018 Omnibus funded three new grant programs (see below) at EPA, which were established under the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016 (P.L. 114-322). These new grant programs will be administered out of EPA's Office of Water.

Attached is the authorizing bill language creating the new programs under the WIIN Act. Stay tuned on next steps as EPA begins to roll out these programs. Please let us know if you have any questions or comments on this.

-Ted

- ***Assistance to Small and Disadvantaged Communities***-Within a Title IV general provision, the bill **provides $20,000,000** to begin a grant program to help small and disadvantaged communities develop and maintain adequate water infrastructure. The program was created in section 2104 of Public Law 114- 322. The Agency is directed to brief the Committees prior to publishing its request for applications related to this new grant program.

- ***Reducing Lead in Drinking Water***-Within a Title IV general provision, the bill **provides $10,000,000** to begin a grant program, created in section 2105 of Public Law 114-322, to provide assistance to eligible entities for lead reduction projects. The Agency is directed to brief the Committees prior to publishing its request for applications related to this new grant program.

- ***Lead Testing in Schools***-Within a Title IV general provision, the bill **provides $20,000,000** to begin a grant program for voluntary testing of drinking water for lead contaminants at schools and child care facilities, as authorized in section 2107 of Public Law 114-322. The Agency is directed to brief the Committees prior to publishing its request for applications related to this new grant program.

SEC. 2104. ASSISTANCE FOR SMALL AND DISADVANTAGED COMMUNITIES.

Part E of the Safe Drinking Water Act (42 U.S.C. 300j et seq.) is amended by adding at the end the following:

``SEC. 1459A. <<NOTE: 42 USC 300j-19a.>> ASSISTANCE FOR SMALL AND DISADVANTAGED COMMUNITIES.

``(a) Definition of Underserved Community.--In this section:

``(1) In general.--The term `underserved community' means a political subdivision of a State that, as determined by the Administrator, has an inadequate system for obtaining drinking water.

``(2) Inclusions.--The term `underserved community' includes a political subdivision of a State that either, as determined by the Administrator--

``(A) does not have household drinking water or wastewater services; or

``(B) is served by a public water system that violates, or exceeds, as applicable, a requirement of a national primary drinking water regulation issued under section 1412, including--

``(i) a maximum contaminant level;

``(ii) a treatment technique; and

``(iii) an action level.

``(b) Establishment.--

``(1) In general.--The Administrator shall establish a program under which grants are provided to eligible entities for use in carrying out projects and activities the primary purposes of which are to assist public water systems in meeting the requirements of this title.

``(2) Inclusions.--Projects and activities under paragraph (1) include--

``(A) investments necessary for the public water system to comply with the requirements of this title;

``(B) assistance that directly and primarily benefits the disadvantaged community on a per-household basis; and

``(C) programs to provide household water quality testing, including testing for unregulated contaminants.

``(c) Eligible Entities.--An eligible entity under this section--

``(1) is--

``(A) a public water system;

``(B) a water system that is located in an area governed by an Indian Tribe; or

``(C) a State, on behalf of an underserved community; and

``(2) serves a community--

``(A) that, under affordability criteria established by the State under section 1452(d)(3), is determined by the State--

``(i) to be a disadvantaged community; or

``(ii) to be a community that may become a disadvantaged community as a result of carrying out a project or activity under subsection (b); or

``(B) with a population of less than 10,000 individuals that the Administrator determines does not have the capacity to incur debt sufficient to finance a project or activity under subsection (b).

``(d) Priority.--In prioritizing projects and activities for implementation under this section, the Administrator shall give priority to projects and activities that benefit underserved communities.

``(e) Local Participation.--In prioritizing projects and activities for implementation under this section, the Administrator shall consult with and consider the priorities of States, Indian Tribes, and local governments in which communities described in subsection (c)(2) are located.

``(f) Technical, Managerial, and Financial Capability.--The Administrator may provide assistance to increase the technical, managerial, and financial capability of an eligible entity receiving a grant under this section if the Administrator determines that the eligible entity lacks appropriate technical, managerial, or financial capability and is not receiving such assistance under another Federal program.

``(g) Cost Sharing.--Before providing a grant to an eligible entity under this section, the Administrator shall enter into a binding agreement with the eligible entity to require the eligible entity--

``(1) to pay not less than 45 percent of the total costs of the project or activity, which may include services, materials, supplies, or other in-kind contributions;

``(2) to provide any land, easements, rights-of-way, and relocations necessary to carry out the project or activity; and

``(3) to pay 100 percent of any operation and maintenance costs associated with the project or activity.

``(h) Waiver.--The Administrator may waive, in whole or in part, the requirement under subsection (g)(1) if the Administrator determines that an eligible entity is unable to pay, or would experience significant financial hardship if required to pay, the non-Federal share.

``(i) Limitation on Use of Funds.--Not more than 4 percent of funds made available for grants under this section may be used to pay the administrative costs of the Administrator.

``(j) Authorization of Appropriations.--There are authorized to be appropriated to carry out this section, $60,000,000 for each of fiscal years 2017 through 2021.''.

SEC. 2105. REDUCING LEAD IN DRINKING WATER.

Part E of the Safe Drinking Water Act (42 U.S.C. 300j et seq.) is further amended by adding at the end the following:

Part E of the Safe Drinking Water Act (42 U.S.C. 300j et seq.) is further amended by adding at the end the following:

``SEC. 1459B. <<NOTE: 42 USC 300j-19b.>> REDUCING LEAD IN DRINKING WATER.

``(a) Definitions.--In this section:

``(1) Eligible entity.--The term `eligible entity' means--

``(A) a community water system;

``(B) a water system located in an area governed by an Indian Tribe;

``(C) a nontransient noncommunity water system;

``(D) a qualified nonprofit organization, as determined by the Administrator, servicing a public water system; and

``(E) a municipality or State, interstate, or intermunicipal agency.

``(2) Lead reduction project.--

``(A) In general.--The term `lead reduction project' means a project or activity the primary purpose of which is to reduce the concentration of lead in water for

human consumption by--
``(i) replacement of publicly owned lead service lines;
``(ii) testing, planning, or other relevant activities, as determined by the Administrator, to identify and address conditions (including corrosion control) that contribute to increased concentration of lead in water for human consumption; and
``(iii) providing assistance to low-income homeowners to replace lead service lines.
``(B) Limitation.--The term `lead reduction project' does not include a partial lead service line replacement

if, at the conclusion of the service line replacement, drinking water is delivered to a household through a publicly or privately owned portion of a lead service line.
``(3) Low-income.--The term `low-income', with respect to an individual provided assistance under this section, has such meaning as may be given the term by the Governor of the State in which the eligible entity is located, based upon the affordability criteria established by the State under section 1452(d)(3).
``(4) Lead service line.--The term `lead service line' means a pipe and its fittings, which are not lead free (as defined in section 1417(d)), that connect the drinking water main to the building inlet.
``(5) Nontransient noncommunity water system.--The term `nontransient noncommunity water system' means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

``(b) Grant Program.--
``(1) Establishment.--The Administrator shall establish a grant program to provide assistance to eligible entities for lead reduction projects in the United States.
``(2) Precondition.--As a condition of receipt of assistance under this section, an eligible entity shall take steps to identify--
``(A) the source of lead in the public water system that is subject to human consumption; and
``(B) the means by which the proposed lead reduction project would meaningfully reduce the concentration of lead in water provided for human consumption by the applicable public water system.
``(3) Priority application.--In providing grants under this subsection, the Administrator shall give priority to an eligible entity that--
``(A) the Administrator determines, based on affordability criteria established by the State under section 1452(d)(3), to be a disadvantaged community; and
``(B) proposes to--
``(i) carry out a lead reduction project at a public water system or nontransient noncommunity water system that has exceeded the lead action level established by the Administrator under section 1412 at any time during the 3-year period preceding the date of submission of the application of the eligible entity; or
``(ii) address lead levels in water for human

consumption at a school, daycare, or other facility that primarily serves children or other vulnerable human subpopulation described in section 1458(a)(1).

``(4) Cost sharing.--

``(A) In general.--Subject to subparagraph (B), the non-Federal share of the total cost of a project funded by a grant under this subsection shall be not less than 20 percent.

``(B) Waiver.--The Administrator may reduce or eliminate the non-Federal share under subparagraph (A) for

reasons of affordability, as the Administrator determines to be appropriate.

``(5) Low-income assistance.--

``(A) In general.--Subject to subparagraph (B), an eligible entity may use a grant provided under this subsection to provide assistance to low-income homeowners to replace the lead service lines of such homeowners.

``(B) Limitation.--The amount of a grant provided to a low-income homeowner under this paragraph shall not exceed the standard cost of replacement of the privately owned portion of the lead service line.

``(6) Special consideration for lead service line replacement.--In carrying out lead service line replacement using a grant under this subsection, an eligible entity--

``(A) shall notify customers of the replacement of any publicly owned portion of the lead service line;

``(B) may, in the case of a homeowner who is not low-income, offer to replace the privately owned portion of the lead service line at the cost of replacement for that homeowner's property;

``(C) may, in the case of a low-income homeowner, offer to replace the privately owned portion of the lead service line at a cost that is equal to the difference between--

``(i) the cost of replacement; and

``(ii) the amount of assistance available to the low-income homeowner under paragraph (5);

``(D) shall notify each customer that a planned replacement of any publicly owned portion of a lead service line that is funded by a grant made under this subsection will not be carried out unless the customer agrees to the simultaneous replacement of the privately owned portion of the lead service line; and

``(E) shall demonstrate that the eligible entity has considered other options for reducing the concentration of lead in its drinking water, including an evaluation of options for corrosion control.

``(c) Limitation on Use of Funds.--Not more than 4 percent of funds made available for grants under this section may be used to pay the administrative costs of the Administrator.

``(d) Authorization of Appropriations.--There is authorized to be appropriated to carry out this section $60,000,000 for each of fiscal years 2017 through 2021.

``(e) Savings Clause.--Nothing in this section affects whether a public water system is responsible for the replacement of a lead service line that is--

``(1) subject to the control of the public water system; and
``(2) located on private property.''.

SEC. 2106. NOTICE TO PERSONS SERVED.

(a) Enforcement of Drinking Water Regulations.--Section 1414(c) of the Safe Drinking Water Act (42 U.S.C. 300g-3(c)) is amended--

(1) in the subsection heading, by striking ``Notice to'' and inserting ``Notice to States, the Administrator, and'';

(2) in paragraph (1)--

(A) in subparagraph (C), by striking ``paragraph (2)(E)'' and inserting ``paragraph (2)(F)''; and

(B) by adding at the end the following:

``(D) Notice that the public water system exceeded the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or notification in a successor regulation promulgated pursuant to section 1412).'';

(3) in paragraph (2)--

(A) in subparagraph (B)(i)(II), by striking ``subparagraph (D)'' and inserting ``subparagraph (E)'';

(B) in subparagraph (C)--

(i) in the subparagraph heading, by striking ``Violations'' and inserting ``Notice of violations or exceedances'';

(ii) in the matter preceding clause (i)--

(I) in the first sentence, by striking ``violation'' and inserting ``violation, and each exceedance described in paragraph (1)(D),''; and

(II) in the second sentence, by striking ``violation'' and inserting ``violation or exceedance'';

(iii) by striking clause (i) and inserting the following:

``(i) be distributed as soon as practicable, but not later than 24 hours, after the public water system learns of the violation or exceedance;'';

(iv) in clause (ii), by inserting ``or exceedance'' after ``violation'' each place it appears;

(v) by striking clause (iii) and inserting the following:

``(iii) be provided to the Administrator and the head of the State agency that has primary enforcement responsibility under section 1413, as applicable, as soon as practicable, but not later than 24 hours after the public water system learns of the violation or exceedance; and''; and

(vi) in clause (iv)--

(I) in subclause (I), by striking ``broadcast media'' and inserting ``media, including broadcast media''; and

(II) in subclause (III), by striking ``in lieu of notification by means of broadcast media or newspaper'';

(C) by redesignating subparagraphs (D) and (E) as subparagraphs (E) and (F), respectively; and

(D) by inserting after subparagraph (C) the following:

``(D) Notice by the administrator.--If the State with primary enforcement responsibility or the owner or operator of a public water system has not issued a notice under subparagraph (C) for an exceedance of the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or notification in a successor regulation promulgated pursuant to section 1412) that has the potential to have serious adverse effects on human health as a result of short-term exposure, not

later than 24 hours after the Administrator is notified of the exceedance, the Administrator shall issue the required notice under that subparagraph.'';

(4) in paragraph (3)(B), in the first sentence--

(A) by striking ``subparagraph (A) and'' and inserting ``subparagraph (A),''; and

(B) by striking ``subparagraph (C) or (D) of paragraph (2)'' and inserting ``subparagraph (C) or (E) of paragraph (2), and notices issued by the Administrator with respect to public water systems serving Indian Tribes under subparagraph (D) of that paragraph'';

(5) in paragraph (4)(B)--

(A) in clause (ii), by striking ``the terms'' and inserting ``the terms `action level','';

(B) by striking clause (iii) and inserting the following:

``(iii) If any regulated contaminant is detected in the water purveyed by the public water system, a statement describing, as applicable--

``(I) the maximum contaminant level goal;

``(II) the maximum contaminant level;

``(III) the level of the contaminant in the water system;

``(IV) the action level for the contaminant; and

``(V) for any contaminant for which there has been a violation of the maximum contaminant level during the year concerned, a brief statement in plain language regarding the health concerns that resulted in regulation of the contaminant, as provided by the Administrator in regulations under subparagraph (A).''; and

(C) in the undesignated matter following clause (vi), in the second sentence, by striking ``subclause (IV) of clause (iii)'' and inserting ``clause (iii)(V)''; and

(6) by adding at the end the following:

``(5) Exceedance of lead level at households.--

``(A) Strategic plan.--Not later than 180 days after the date of enactment of this paragraph, the Administrator shall, in collaboration with owners and operators of public water systems and States, establish a strategic plan for how the Administrator, a State with primary enforcement responsibility, and owners and operators of public water systems shall provide targeted outreach, education, technical assistance, and risk communication to populations affected by the concentration of lead in a public water system, including dissemination of information described in subparagraph (C).

``(B) EPA initiation of notice.--

``(i) Forwarding of data by employee of the agency.--If the Agency develops, or receives from a source other than a State or a public water system, data that meets the requirements of section 1412(b)(3)(A)(ii) that indicates that the drinking water of a household served by a public water system contains a level of lead that exceeds the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or

notification in a successor regulation promulgated pursuant to section 1412) (referred to in this paragraph as an `affected household'), the Administrator shall require an appropriate employee of the Agency to forward the data, and information on the sampling techniques used to obtain the data, to the owner or operator of the public water system and the State in which the affected household is located within a time period determined by the Administrator.

``(ii) Dissemination of information by owner or operator.--The owner or operator of a public water system shall disseminate to affected households the information described in subparagraph (C) within a time period established by the Administrator, if the owner or operator--

``(I) receives data and information under clause (i); and

``(II) has not, since the date of the test that developed the data, notified the affected households--

``(aa) with respect to the concentration of lead in the drinking water of the affected households; and

``(bb) that the concentration of lead in the drinking water of the affected households exceeds the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or notification in a successor regulation promulgated pursuant to section 1412).

``(iii) Consultation.--

``(I) Deadline.--If the owner or operator of the public water system does not disseminate to the affected households the information described in subparagraph (C) as required under clause (ii) within the time period established by the Administrator, not later than 24 hours after the Administrator becomes aware of the failure by the owner or operator of the public water system to disseminate the information, the Administrator shall consult, within a period not to exceed 24 hours, with the applicable Governor to develop a plan, in accordance with the strategic plan, to disseminate the information to the affected households not later than 24 hours after the end of the consultation period.

``(II) Delegation.--The Administrator may only delegate the duty to consult under subclause (I) to an employee of the Agency who, as of the date of the delegation, works in the Office of Water at the headquarters of the Agency.

``(iv) Dissemination by administrator.--The Administrator shall, as soon as practicable, disseminate to affected households the information described in subparagraph (C) if--

``(I) the owner or operator of the public water system does not disseminate the information to the affected households within the time period determined by the Administrator, as required by clause (ii); and

``(II)(aa) the Administrator and the applicable Governor do not agree on a plan described in clause (iii)(I) during the consultation period under that clause; or

``(bb) the applicable Governor does not disseminate the information within 24 hours after the end of the consultation period.

``(C) Information required.--The information described in this subparagraph includes--

``(i) a clear explanation of the potential adverse effects on human health of drinking water that contains a concentration of lead that exceeds the lead action level under section 141.80(c) of title 40, Code of Federal Regulations (or a prescribed level of lead that the Administrator establishes for public education or notification in a successor regulation promulgated pursuant to section 1412);

``(ii) the steps that the owner or operator of the public water system is taking to mitigate the concentration of lead; and

``(iii) the necessity of seeking alternative water supplies until the date on which the concentration of lead is mitigated.

``(6) Privacy.--Any notice to the public or an affected household under this subsection shall protect the privacy of individual customer information.''.

(b) Prohibition on Use of Lead Pipes, Solder, and Flux.--Section 1417 of the Safe Drinking Water Act (42 U.S.C. 300g-6) is amended by adding at the end the following:

``(f) Public Education.--

``(1) In general.--The Administrator shall make information available to the public regarding lead in drinking water, including information regarding--

``(A) risks associated with lead in drinking water;

``(B) the conditions that contribute to drinking water containing lead in a residence;

``(C) steps that States, public water systems, and consumers can take to reduce the risks of lead in drinking water; and

``(D) the availability of additional resources that consumers can use to minimize lead exposure, including information on sampling for lead in drinking water.

``(2) Vulnerable populations.--In making information available to the public under this subsection, the Administrator shall, subject to the availability of appropriations, carry out targeted outreach strategies that focus on educating groups within the general population that may be at greater risk than the general population of adverse health effects from exposure to lead in drinking water.''.

SEC. 2107. LEAD TESTING IN SCHOOL AND CHILD CARE PROGRAM DRINKING WATER.

(a) In General.--Section 1464 of the Safe Drinking Water Act (42 U.S.C. 300j-24) is amended by striking subsection (d) and inserting the following:

``(d) Voluntary School and Child Care Program Lead Testing Grant Program.--

``(1) Definitions.--In this subsection:

``(A) Child care program.--The term `child care program' has the meaning given the term `early childhood education program' in section 103(8) of the Higher Education Act of 1965 (20 U.S.C. 1003(8)).

``(B) Local educational agency.--The term `local educational agency' means--

``(i) a local educational agency (as defined in section 8101 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 7801));

``(ii) a tribal education agency (as defined in section 3 of the National Environmental Education Act (20 U.S.C. 5502)); and

``(iii) a person that owns or operates a child care program facility.

``(2) Establishment.--

``(A) In general.--Not later than 180 days after the date of enactment of the Water and Waste Act of 2016, the Administrator shall establish a voluntary school and child care program lead testing grant program to make grants available to States to assist local educational agencies in voluntary testing for lead contamination in drinking water at schools and child care programs under the jurisdiction of the local educational agencies.

``(B) Direct grants to local educational agencies.--The Administrator may make a grant for the voluntary testing described in subparagraph (A) directly available to--

``(i) any local educational agency described in clause (i) or (iii) of paragraph (1)(B) located in a State that does not participate in the voluntary grant program established under subparagraph (A); or

``(ii) any local educational agency described in clause (ii) of paragraph (1)(B).

``(3) Application.--To be eligible to receive a grant under this subsection, a State or local educational agency shall submit to the Administrator an application at such time, in such manner, and containing such information as the Administrator may require.

``(4) Limitation on use of funds.--Not more than 4 percent of grant funds accepted by a State or local educational agency for a fiscal year under this subsection shall be used to pay the administrative costs of carrying out this subsection.

``(5) Guidance; public availability.--As a condition of receiving a grant under this subsection, the recipient State or local educational agency shall ensure that each local educational agency to which grant funds are distributed shall--

``(A) expend grant funds in accordance with--

``(i) the guidance of the Environmental Protection Agency entitled `3Ts for Reducing Lead in Drinking

Water in Schools: Revised Technical Guidance' and dated October 2006 (or any successor guidance); or

``(ii) applicable State regulations or guidance regarding reducing lead in drinking water in schools and child care programs that are not less stringent than the guidance referred to in clause (i); and

``(B)(i) make available, if applicable, in the administrative offices and, to the extent practicable, on the Internet website of the local educational agency for inspection by the public (including teachers, other school personnel, and parents) a copy of the results of any voluntary testing for lead contamination in school and child care program drinking water carried out using grant funds under this subsection; and

``(ii) notify parent, teacher, and employee organizations of the availability of the results described in clause (i).

``(6) Maintenance of effort.--If resources are available to a State or local educational agency from any other Federal agency, a State, or a private foundation for testing for lead contamination in drinking water, the State or local educational agency shall demonstrate that the funds provided under this subsection will not displace those resources.

``(7) Authorization of appropriations.--There is authorized to be appropriated to carry out this subsection $20,000,000 for each of fiscal years 2017 through 2021.''.

Message

From: Rupp, Mark [Rupp.Mark@epa.gov]
Sent: 7/7/2016 4:39:17 PM
To: Martha Rudolph [martha.rudolph@state.co.us]; adunn@ecos.org; Ed.Ehlinger@state.mn.us; smoffatt@astho.org
CC: sandy.pizzuti@state.mn.us; Grevatt, Peter [Grevatt.Peter@epa.gov]; Jim Taft (Jtaft@asdwa.org) [Jtaft@asdwa.org]
Subject: EPA Letter to ECOS and ASTHO
Attachments: lcr_ashto-ecos_follow-up_letter_7.6.16.pdf

Martha, Ed, Alex and Sharon.

Please find the attached letter from Joel Beauvais to you and your colleagues. Alex and Sharon, if you could please forward it to all of your members, I'd appreciate it. (And you, too, Jim.)

Thanks to you and to all of your colleagues for the work you are doing. Together, we all know there is more to do – and EPA looks forward to doing so in partnership with you.

Mark

Mark W. Rupp
Deputy Associate Administrator for Intergovernmental Relations
Office of Congressional and Intergovernmental Relations
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
(202) 564-6074 (O)
Ex. 6 Personal Privacy (PP)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL - 6 2016

OFFICE OF WATER

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Arlington, VA 22202

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Washington, DC 20001

Dear ECOS and ASTHO leaders:

I am writing to follow up on your members' responses to the EPA's February 29, 2016, letters to state primacy agencies asking that states continue to work collaboratively with the EPA to address deficiencies and improve transparency and public information regarding the implementation of the Lead and Copper Rule (LCR).

At this time, every state has expressly confirmed – either in its initial response to the February 29 letters or in follow-up communications with the EPA – that state protocols and procedures are fully consistent with LCR and applicable EPA guidance, including protocols and procedures for optimizing corrosion control, and that the state has already posted or will post state LCR sampling protocols and guidance to their public websites. The EPA staff will be following up with every state to ensure that these protocols and procedures are clearly understood and are being properly implemented to address lead and copper issues at individual drinking water systems, and to offer EPA assistance if needed. In addition, the EPA staff will continue to engage with states to ensure that lead action level exceedances and LCR violations are promptly and appropriately addressed.

Many of the responses from state commissioners identified practices and policies that enhance the implementation of the LCR and increase public transparency. I encourage all states to continue to learn from one another and to implement best practices that strengthen public health protections. To this end, I would like to highlight some of the promising practices identified in state responses:

Promoting Transparency at State and Public Water Systems:

- A substantial number of states report that they are already posting individual lead compliance sampling results, not just 90th percentile values, on their public websites utilizing Drinking Water Watch or similar database tools.

- Some drinking water systems are providing online searchable databases that provide information on known locations of lead service lines, or providing videos that show homeowners how to determine whether their home is served by a lead service line.

Shortening Reporting and Notice Timeframes

- Some states have adopted more stringent timelines for water systems to provide consumer notices to all who receive water from sites that were sampled and resulted in a lead action level exceedance. While the LCR allows up to 30 days, some states are requiring notice to consumers as quickly as 48 hours after sampling.

- Some states require laboratories that analyze lead compliance samples to contact the state within 24 hours of confirming that a sample analysis has exceeded the 15 parts per billion action level for lead.

Enhancing Rule Implementation:

- Several states are requiring their public water systems to update their "materials evaluations", to increase understanding of lead service line locations and ensure an adequate pool of "Tier 1" locations (meaning locations with known lead service lines or lead plumbing) for LCR compliance sampling.

- Several states are identifying funding mechanisms, such as the Drinking Water State Revolving Fund (DWSRF), to help communities replace lead service lines by providing principal forgiveness and low interest loans and/or maximizing the DWSRF set-asides to fund corrosion control studies when an action level exceedance is triggered.

Additional Actions

- Several states are working with local drinking water systems to partner with local school boards and departments of education to sample and replace old drinking water fountains and fixtures at schools.

- Some states are increasing the availability of water testing, health screenings and blood lead level testing to residents.

Although many states have provided examples of best practices that that go beyond the minimum rule requirements, other states have identified challenges with some of these same activities. In particular, a number of states identified problems with posting individual lead samples because of limited information technology resources and/or concerns with privacy and security. However, the substantial number of states that are posting individual sample results indicates that these challenges can be overcome. The EPA believes that posting of individual sampling results is important for public transparency and intends to work with states that are not yet posting individual sample results – to share lessons learned from states that are already doing so, and to urge all states to adopt this practice.

We are concerned that many states have identified challenges related to lead service line inventories. Improving lead service line inventories is important in ensuring that systems are taking lead samples from valid Tier 1 sites, as required under the LCR, as well as for effective management of risks associated with lead service line disruption, and for providing information to customers on how to assess and mitigate risks from these lines. We are encouraged that some states have identified examples of systems providing online searchable databases of lead service lines, or have committed to working with systems to develop updated inventories. The EPA will continue to work with states to ensure that identification of the locations of LSLs remains a priority for the nation's drinking water systems.

The EPA recognizes that there is also important work to be done to strengthen the LCR, and we look forward to working with the states as we develop the proposed rule revisions. In the interim, the EPA will continue to work closely with the states to ensure that the proper steps are being taken to implement the current rule and protect the public from harmful exposures to lead and copper in drinking water. The EPA strongly encourages states to continue to seek effective strategies and actions to improve address lead in drinking water. Continuing to enhance public transparency and accountability is critical to reassure the public of our continuing work to protect the nation's drinking water.

Again, thank you for your active engagement in this important effort. Please do not hesitate to contact me, or Mark Rupp, Deputy Associate Administrator for the EPA's Office of Intergovernmental Relations, at rupp.mark@epa.gov or 202-564-7178.

Sincerely,

Joel Beauvais
Deputy Assistant Administrator

cc: Peter Grevatt, Director, Office of Ground Water and Drinking Water, US EPA
Jim Taft, Executive Director, Association of State Drinking Water Administrators

Message

From: AWWA [connections@awwa.org]
Sent: 6/21/2016 5:36:05 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: Connect - June 20, 2016 -- Special ACE Edition

American Water Works Association

AWWA CONNECTIONS™

Today's keynote address

Flint Task Force member urges going "above and beyond" in lead testing

Chris Kolb, a member of the Flint Advisory Task Force that investigated that city's lead-in-water crisis, today urged water professionals to go above and beyond the USEPA's minimum standards when testing for lead in water.

Speaking before a standing-room-only crowd at ACE16 in Chicago, Kolb noted that the Lead and Copper Rule sets the action level for lead in water at 15 ppb. In Michigan, the governor has proposed the action level be reduced to 10 ppb.

"The federal regulations are the floor. They're the minimum," Kolb said. "You can go above and beyond….and that's where Michigan is going now."

In the Tuesday keynote address, entitled "An Exploration of What Happened in Flint, Michigan", AWWA CEO David LaFrance asked Kolb a series of questions about the crisis and the path forward for the still-impacted community of just under 100,000. Kolb is a former state representative in Michigan and president of the Michigan Environmental Council. Read More...

In the Exhibit Hall

Service providers celebrate 100+ years of membership

They are the Time-Honored Eleven.

Among the hundreds of service providers exhibiting at ACE this year, 11 have been members of the American Water Works Association for more than 100 years and exhibit year after year at the annual conference.

Two of the companies – Bingham & Taylor and Mueller Company – joined AWWA in 1882, just a year after the Association was founded in St. Louis by a handful of men representing water utilities in six states.

Two other service providers – Evoqua Water Technologies and Infilco Degremont, which is now a legacy brand of SUEZ – celebrated a century of membership last year. Read More...

Poster contestants share "Fresh Ideas"

Young professionals and students from more than 20 AWWA Sections are competing at the annual conference this week in the “Fresh Ideas” poster contest, where they display their innovative research, meet peers, and hobnob with water sector leaders.

“This is a nice adventure,” said Peng Xie, who is earning his master's and doctorate at Clemson University and representing the South Carolina Section. “I entered the contest in hopes of sharing my research as well as picking the brains of industrial and academic leaders that I may come across."

David Yonge, last year's winner, pictured above, said the recognition opened career doors for him. Winners of the 2016 contest will be announced this afternoon during the Water Industry Luncheon. Read More...

Upcoming Events

Top Ops / Preliminary Rounds, 1-4 p.m. Tuesday; Preliminary, Semifinal and Final Rounds, 1-4 p.m. Wednesday, Exhibit Hall

"Best of the Best" Tap Water Taste Test / 3:30-4:30 p.m. Tuesday

Sweet Social Networking Event / 12:30-2:00 p.m. Wednesday, Exhibit Hall

Hydrant Hysteria Demo / 1-3 p.m. Wednesday, Exhibit Hall

ACE Wrap Party / 5 p.m.-6:30 p.m. Wednesday, Lakeside Terrace

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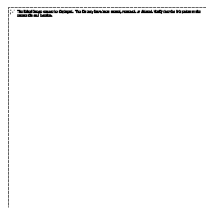
M17 Fire Hydrants -- New Edition Available



M17 Fire Hydrants: Installation, Field Testing, and Maintenance, Fifth Edition, includes drawings and approved procedures for fire hydrant design, installation and maintenance practices for both wet-barrel and dry-barrel styles. This edition has been updated with new regulatory information and essential 'rip and run' forms for testing procedures. Both hard copy and PDF available. Also available with this new edition is a free print-ready poster depicting wet and dry-barrel hydrant designs.
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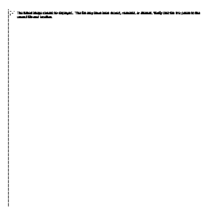

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AWWA Connections is published every other Friday for members. It features water community news and colleague profiles, opportunities to engage and network, career development tips and more. If you have a comment or story idea for *Connections*, please contact us at connections@awwa.org.

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Message

From: Tracy Mehan [tmehan@awwa.org]
Sent: 10/13/2016 3:00:37 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
CC: Greg Kail [GKail@awwa.org]; svia@awwa.org
Subject: Your memo to regional water directors

Peter,

Thank you for your voice message re your memo going to regional water directors urging them to focus on two aspects of LCR implementation, especially Tier 1 sites and triennial monitoring for systems with prior exceedances of the action level. I hope I have that right, but if you could forward your actual memo when issued, that would be most helpful.

Thanks, again.

Tracy

Message

From: Goodmann, Peter (EEC) [Peter.Goodmann@ky.gov]
Sent: 3/8/2018 9:53:34 PM
To: LCRConsultation [LCRConsultation@epa.gov]
CC: Grevatt, Peter [Grevatt.Peter@epa.gov]; Gregory Heitzman [Gheitzman@bluewaterky.com]; Roberson, Alan [aroberson@asdwa.org]
Subject: Kentucky Response to the Federal Consultation Process for Revisions to the Lead and Copper Rule
Attachments: Response to Federal Consultation for P Grevatt.pdf; Ky Lead Workgroup Recommendations 3-8-18 Final gch rev1.pdf

Thank you for the opportunity to share Kentucky's experience with lead in drinking water. We hope that these comments will assist EPA delevop pratical and feasible revisions to the Lead and Copper Rule that will further reduce the public health risk posed by lead, recognizing the financial constraints and the time needed to implement sound, beneficial changes to current practices.

Sincerely,

Pete

Peter T. Goodmann, Director
Division of Water
300 Sower Blvd
Frankfort, Kentucky 40601
(502) 782-6956

Kentucky Lead Workgroup Recommendations

March 1, 2018

Document Compiled by
Greg Heitzman
Chair, Kentucky Lead Workgroup

Following the 2015 public health crisis in Flint Michigan, the Kentucky Environmental Protection Cabinet formed the Kentucky Lead Workgoup to evaluate the current state of lead in drinking water in Kentucky. The Workgroup has been meeting periodically since May 2016 to review current practices in managing lead in Kentucky's public drinking water systems. The 12-member Workgroup has representation from small, medium, large public water systems, regulators, public health, engineering professionals, academia and industry associations. The Workgroup established seven subgroups to review and evaluate lead in the areas of public health, drinking water regulations, water treatment/corrosion control, water distribution/piping, training/education, finance/funding, and communications. The initial recommendations were presented at the Kentucky-Tennessee Water Professional Conference on July 11, 2017. The meetings of the Workgroup are open to the public and minutes and presentations are available online at *http://water.ky.gov/drinkingwater*. Recommendations are organized into the following stakeholder groups: State Agency; Public Water System/Utility; Drinking Water Industry Associations; and Research Organizations. The recommendations will be submitted to the Kentucky Drinking Water Advisory Council on March 13, 2018.

1.0 - State Agency Recommendations:

Kentucky Division of Water (KDOW), Kentucky Infrastructure Authority (KIA), Kentucky Division of Compliance Assistance (KDCA), Kentucky Department of Public Health (KDPH), Kentucky Department of Education (KDE).

The agency recommendations included herein should be evaluated by the respective state agencies and implemented where budget resources are available. The recommendations should be evaluated *in partnership with water industry stakeholders (utilities, industry associations and consulting community) and presented to the Kentucky Drinking Water Advisory Council for review and comment prior to implementation. State Agencies should consider the following recommendations:*

1.1 Develop protocol, guidance and technical assistance for evaluation of treatment process changes using the US EPA's Optimal Corrosion Control Treatment (OCCT) report published March 2016. A Corrosion Control Plan (CCP) should be developed when:

   a. a new water source is introduced (including interconnects with utilities);
   b. the water source is changed;
   c. the water treatment process is changed (including chemical additives);
   d. lead compliance sampling results are near or exceed the EPA Action Level (currently 15 ppb);
   e. an interim supply is needed (excludes emergency supply)

   A CCP is a complex analysis. To assure optimal water treatment quality is achieved and regulatory compliance is maintained, the CCP should be conducted by a qualified water quality professional. As recommended by EPA, the CCP should be developed in coordination with the Kentucky Division of Water.

   Responsible Parties: KDOW, Drinking Water Utilities. Kentucky Rural Water, KY-TN AWWA.

1.2 Establish protocol and reporting requirements for utilities to use for the collection and reporting of special lead samples and when customers request water sample testing for lead.

   Responsible Parties: KDOW, with input from Drinking Water Utilities.

1.3 Update the estimated number of lead service lines (public and private) in Kentucky and the associated replacement costs.

   Responsible Parties: KDOW, Kentucky Rural Water, KY-TN AWWA, Drinking Water Utilities.

1.4 Revise prioritization criteria for state-wide water projects to include lead service line replacement.

   Responsible Parties: KDOW, KIA with input from Drinking Water Utilities.

1.5 Develop funding sources that utilities can use to finance lead service line replacement (public and private) and lead abatement projects. Funding sources may include: KIA, Rural Development, SRF funding, and state/local appropriations.

   Responsible Parties: KIA and Rural Development with input from KDOW and Drinking Water Utilities.

1.6 Develop a lead training curriculum in partnership with utilities, state and local health departments, and water industry associations. The training should include corrosion control treatment methods, lead service line replacement and repair practices, flushing practices and customer communications.

Responsible Parties: KDOW, KDCA, KDPH, Kentucky Rural Water, KY-TN AWWA, Drinking Water Utilities.

1.7 Consider Kentucky state legislation for requiring blood lead level testing for all children at 12 and 24 months of age.

Responsible Parties: KDPH in collaboration with KDOW, Drinking Water Utilities, Kentucky Rural Water, KY-TN AWWA.

1.8 Update the Kentucky Division of Water's website to serve as a resource for information on lead in drinking water, best practices, health impacts, and regulatory requirements.

Responsible Parties: KDOW in collaboration with Drinking Water Utilities, Kentucky Rural Water, KY-TN AWWA.

1.9 Promote the use of U.S. EPA's 3T (Training, Testing and Telling) program for reducing lead in drinking water in schools and child care centers. The program includes: Training of school officials on the potential of lead in drinking water; Testing of drinking water in schools to identify potential problems and corrective actions (as needed); and Telling staff, parents, students and the local community about the testing results, potential risks and remedial actions taken by the school.

Responsible Parties: KDE, School Officials and Child Care Centers in partnership with KDPH, and local public health officials.

1.10 Monitor lead testing programs for schools and child care centers being used in other states and consider implementing in Kentucky following a review of benefits and costs.

Responsible Parties: KDPH, KIA and KDOW in collaboration with Drinking Water Utilities, Kentucky Rural Water, KY-TN AWWA.

2.0 - Public Water System/Utility Recommendations:

The public water system/utility recommendations included herein should be considered on a case-by-case basis, with consideration given to: budget and resource availability; the technical expertise and knowledge of the utility; the feasibility and practicality of implementation; the impact on customer water rates and fees; and the size of the utility (population served, number of customers, water demand and size of distribution system). Public Water Systems/utilities should consider the following recommendations:

2.1 Conduct a Corrosion Control Evaluation (CCE) and develop a Corrosion Control Plan (CCP) for water treatment and distribution operations following the guidance provided in US EPA's Optimal Corrosion Control Treatment (OCCT) report published March 2016. A CCP should be developed when:

a. a new water source is introduced (including interconnects with utilities);
b. the water source is changed;
c. the water treatment process is changed (including chemical additives);
d. lead compliance sample results are near or exceed the EPA Action Level (currently 15 ppb);
e. an interim supply is needed (excludes emergency supply).

A CCP is a complex analysis. To assure optimal water treatment quality is achieved and regulatory compliance is maintained, the CCP should be conducted by a qualified water quality professional. As recommended by EPA, the CCP should be developed in coordination with the Kentucky Division of Water.

Responsible Parties: Drinking Water Utilities and KDOW.

2.2 Adopt the EPA recommended guidelines for lead compliance sampling.

Responsible Parties: Drinking Water Utilities and KDOW.

2.3 Prepare for a reduction in the EPA Lead Action Level from 15 parts per billion (ppb) to less than 10 ppb as part of a revised Lead and Cooper Rule (LCR).

Responsible Parties: Drinking Water Utilities and KDOW.

2.4 Prepare for more frequent sampling cycles and more diverse sampling locations for LCR compliance.

Responsible Parties: Drinking Utilities and KDOW.

2.5 Adopt a policy or practice to remove public lead service lines when exposed during excavation. Communicate the discovery of any private lead service lines to the homeowner/occupant. The communication message should define the homeowner's responsibility for private plumbing, the benefits of flushing and the impacts of lead contained in plumbing fittings and fixtures.

Responsible Parties: Drinking Water Utilities with assistance from Kentucky Rural Water and KY-TN AWWA.

2.6 Proactively investigate the location of public lead service lines using various methods (historical records, maps, construction plans, field surveys, home age, etc.). The service line information (public portion) should be added to the water distribution inventory, maps and records (include material type, age, condition, and other attributes where available).

Responsible Parties: Drinking Water Utilities.

2.7 Provide customers access to an on-line database of utility-confirmed lead service line locations (public portion).

Responsible Parties: Drinking Water Utilities.

2.8 Adopt a long-term goal of replacing all lead service lines. The implementation practices and the time line associated with this goal will be based on local conditions and financial capability.

Responsible Parties: Drinking Water Utilities.

2.9 Develop consumer education materials on lead in drinking water in collaboration with industry associations, regulators, and public health officials. The education materials should: include the health risks associated with lead; include guidance on common methods to reduce lead exposure; and identify the homeowner responsibility for private service lines and plumbing fixtures. The information should be provided to consumers and stakeholders through Consumer Confidence Reports, websites, social media, door hangers and other available communication methods.

Responsible Parties: Drinking Water Utilities in partnership with Kentucky Rural Water, KY-TN AWWA, KDOW, State and Local Health Departments,

2.10 Train field personnel to identify, locate, repair, and/or replace lead service lines and lead-containing fittings.

Responsible Parties: Drinking Water Utilities.

2.11 Monitor state and national best practices on managing lead in drinking water. Practical and feasible practices should be implemented where appropriate.

Responsible Parties: Drinking Water Utilities.

2.12 Review the ANSI/AWWA Standard C810-17 on Replacement and Flushing of Lead Service Lines (published November 1, 2017). The standard should be adopted where feasible and practical.

Responsible Parties: Drinking Water Utilities.

2.13 Develop a program to partner with the health department, public/private schools and childcare centers for testing, education and coordination of replacement of lead piping and plumbing fixtures within school and childcare facilities. The program should include a protocol for reporting results of lead testing to the utility, schools and child care centers, local health department and Kentucky Division of Water.

Responsible Parties: Drinking Water Utilities, local Health Departments, Public/Private Schools, and Childcare Centers.

3.0 - Drinking Water Associations:

Kentucky Rural Water, Kentucky-Tennessee AWWA, KY Water/Wastewater Operators Association, and other industry associations.

The drinking water association recommendations included herein should be evaluated by the respective associations and implemented where feasible and practical, using a collaborative process with utilities, drinking water regulators, and key stakeholders. Drinking water associations should consider the following recommendations:

3.1 Develop a utility training curriculum on lead in drinking water, including: lead treatment (corrosion control); water sampling protocol; system assessment for lead; lead inventory; lead service line repair; lead service line replacement (public and private); the potential source of lead from homeowner plumbing fixtures; and communication materials for consumers.

Responsible Parties: Kentucky Rural Water, KY-TN AWWA, Kentucky Water/Wastewater Operators Association, and Drinking Water Utilities.

3.2 Identify key stakeholders and develop lead communication tools, including web site links and templates, for utilities to use in communicating with customers. Utilize existing resources from national and local partners. The materials should include information on the homeowner responsibility for private lead service lines and plumbing fixtures that may be sources of lead.

Responsible Parties: Kentucky Rural Water, KY-TN AWWA, and Drinking Water Utilities.

3.3 Engage and educate key stakeholders on lead in drinking water. Key stakeholders include health departments, medical professionals, regulatory agencies, education officials, engineering professionals, building trades, homeowners and other organizations that are impacted by or establish policy or regulations regarding lead in drinking water.

Responsible Parties: Kentucky Rural Water, KY-TN AWWA, Kentucky Water/Wastewater Operators Association, and Drinking Water Utilities

3.4 Pursue financial assistance from local, state and federal agencies for public and private lead service line replacement, utilizing the State Revolving Loan Fund Program and other financial assistance programs for home lead abatement.

Responsible Parties: KDOW, KIA, Kentucky Rural Water, KY-TN AWWA, Kentucky Water/Wastewater Operators Association, Drinking Water Utilities, and local government agencies.

4.0 - Research and Development Organizations:

Water Research Foundation, U.S. EPA Office of Research and Development, Universities, and other research groups)

The Research and Development recommendations are provided for consideration by organizations that conduct applied research in areas of public health, water treatment and water delivery. The following recommendations will be forwarded to the Water Research Foundation and US EPA Office of Research and Development for consideration in their future research planning and budgets.

4.1 Develop technology to identify buried lead service lines (non-destructive).

Responsible Parties: Water Research Foundation, Universities and private sector market.

4.2 Advance utility best practices for full (public and private) and partial (public portion only) replacement of lead service lines.

Responsible Parties: Water Research Foundation, Universities and private sector market.

4.3 Conduct research on the impact of lead in drinking water on human health. This work will assist in identifying an appropriate action level for lead in drinking water.

Responsible Parties: US EPA, Centers for Disease Control and Prevention (CDC), National Science Foundation, National Institute of Health, Health Foundations Universities, Water Research Foundation and Drinking Water Utilities.

4.4 Evaluate the cost effectiveness of point of use (POU) and point of entry (POE) treatment devices for lead removal as an alternative to treatment changes or lead service line replacement to achieve compliance with the Lead and Copper Rule lead action level (currently 15 ppb).

Responsible Parties: EPA, Water Research Foundation, Drinking Water Utilities and private sector market.

4.5 Conduct research to determine the best sampling methods to obtain a representative sample of lead in drinking water for purposes of Lead and Copper Rule compliance monitoring.

Responsible Parties: EPA, Water Research Foundation, Drinking Water Utilities and private sector market.

END OF DOCUMENT

MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

AARON B. KEATLEY
COMMISSIONER

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

March 8, 2018

Peter Grevatt
Director, Office of Ground Water and Drinking Water
1200 Pennsylvania Avenue, N. W.
Mail Code: 4601M
Washington, DC 20460

Subject: Response to the Federal Consultation Process for Revisions to the Lead and Copper Rule

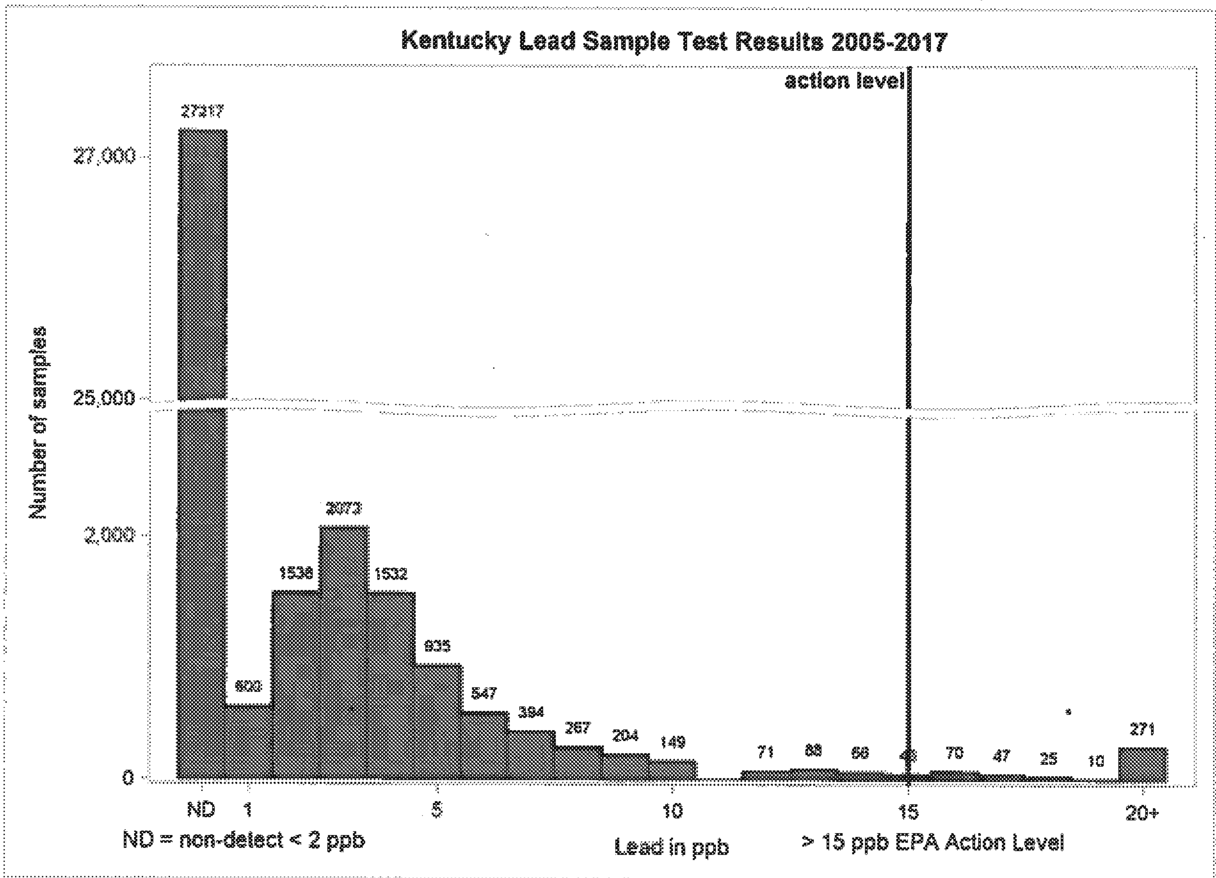
Dear Peter:

This letter serves as the response from the Kentucky Division of Water to provide input to EPA on revisions to Lead and Copper Rule (LCR) as part of the Federal consultation process. Kentucky has been proactive since the public health crisis that occurred in Flint, Michigan with elevated blood lead levels from the lead discovered in Flint's water system. In response to this crisis, the Kentucky Division of Water convened a stakeholder group of water industry professionals in May, 2016 to evaluate the current and future impacts on utilities in managing lead in drinking water.

The stakeholder group, known as the Kentucky Lead Workgroup, is comprised of professionals from drinking water systems, environmental agencies, public health agencies, academia, and water industry associations. The Workgroup has met periodically over the past 20 months to evaluate seven different areas that impact lead in drinking water, including: public health, regulations, treatment and corrosion control, distribution and plumbing materials, training and education, financing and funding, and communications. The workgroup meetings are open to the public and minutes and reports are available on line at http://water.ky.gov/drinking water. In July 2017, the workgroup presented its initial findings and draft recommendations at the Kentucky-Tennessee Water Professionals Conference in Lexington, Kentucky. These sessions provided opportunities for dialog, education, and discussion of best practices for managing lead in drinking water.

Overall, Kentucky has been proactive in addressing lead in drinking water. 36,270 lead compliance samples were collected between 2005 and 2017. Seventy-five percent (75%) of the samples had no detection of lead (< 2 ppb), and 98.8% of the samples were below the action level of 15 ppb.

During the twelve year sampling period, eight systems (2%) of Kentucky's public water supply systems exceeded the EPA Action Lead of 15 ppb, and three systems (<1%) required additional corrective action. Since 2012, all 390 Kentucky public water systems to which the Lead and Copper Rule (LCR) applies have been in compliance with the LCR. The histogram below illustrates lead compliance sampling results. The data distribution shows that approximately 98% of the samples collected were 10 ppb or lower.



The primary sources of lead in drinking water in Kentucky public water systems include public lead service lines, private lead service lines, and private plumbing fixtures and lead based solder. Louisville, the largest public water system in Kentucky, had the largest installed inventory of lead service lines, with over 70,000 installed from 1860 to 1940. Through a proactive program of replacement, Louisville now has fewer than 5,000 lead service lines remaining. Louisville has established a goal to replace all lead service lines by 2020. With Louisville's aggressive program, it is estimated that Kentucky has fewer than 20,000 lead service lines remaining compared to the AWWA/EPA estimate of 53,000. These lines are generally located in older, urban Kentucky communities. Service line materials and ownership practices vary widely across the Commonwealth, but in general, Kentucky water systems phased out the use of lead and transitioned to copper or other materials between 1940 and 1950.

Kentucky water supplies are comprised primarily of surface and ground water sources, and systems have achieved compliance with the Lead and Copper Rule through optimized corrosion control with pH and alkalinity adjustment. Proactive communications, education, technical assistance, and best practices have had positive results as demonstrated by the compliance data summarized above. Additionally, the Kentucky Department for Public Health reports that there are no documented instances of elevated blood lead levels in Kentucky attributable to drinking water. The majority of elevated blood lead levels cases have been tied to lead based paint or other sources of lead.

The Kentucky Lead Workgroup is now finalizing its recommendations, a copy of which are attached to this letter. I pray these recommendations are considered by the EPA when developing proposed revisions to the Lead and Copper Rule. I expect the workgroup to complete a final report of findings and recommendations by July 2018. The final report of the Kentucky Lead Workgroup will be published on the Kentucky Division of Water website: http://water.ky.gov/drinking water.

Thank you for the opportunity to share Kentucky's experience with lead in drinking water. I hope these comments will assist the EPA in developing practical and feasible revisions to the Lead and Copper Rule that will further reduce the public health risk posed by lead, and recognize the financial constraints and the time needed to implement sound, beneficial changes to current practices.

Sincerely,

Peter T. Goodmann, Director
Division of Water

c: Charles G. Snavely, Secretary
Aaron Keatley, Commissioner
J. Alan Robertson, ASDWA
Greg Heitzman, Chair, Kentucky Lead Workgroup

Attachments

Message

From: Tracy Mehan [tmehan@awwa.org]
Sent: 1/27/2016 9:11:00 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
CC: Shapiro, Mike [Shapiro.Mike@epa.gov]
Subject: FW: Draft water legislation
Attachments: INCASE Notification Bill_Final.pdf

Attached is the new legislation introduced by members of the Michigan congressional delegation.

Tracy

From: Tommy Holmes
Sent: Wednesday, January 27, 2016 4:01 PM
To: Tracy Mehan <tmehan@awwa.org>
Subject: FW: Draft water legislation

From: McCarthy, David [mailto:David.McCarthy@mail.house.gov]
Sent: Wednesday, January 27, 2016 3:07 PM
To: Tommy Holmes <THolmes@awwa.org>
Cc: Couri, Jerry <JerryCouri@mail.house.gov>
Subject: Draft water legislation

114TH CONGRESS
2D SESSION

S. ______

To amend the Safe Drinking Water Act to authorize the Administrator of the Environmental Protection Agency to notify the public if a State agency and public water system are not taking action to address a public health risk associated with drinking water requirements.

IN THE SENATE OF THE UNITED STATES

Mr. PETERS (for himself and Ms. STABENOW) introduced the following bill; which was read twice and referred to the Committee on ________________

A BILL

To amend the Safe Drinking Water Act to authorize the Administrator of the Environmental Protection Agency to notify the public if a State agency and public water system are not taking action to address a public health risk associated with drinking water requirements.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Improving Notification for Clean and Safe Drinking Water Act of 2016".

SEC. 2. ENFORCEMENT OF DRINKING WATER REGULATIONS.

(a) EXCEEDANCE OF LEAD ACTION LEVEL.—Section 1414(c) of the Safe Drinking Water Act (42 U.S.C. 300g–3(c)) is amended—

(1) in paragraph (1), by adding at the end the following:

"(D) Notice of any exceedance of a lead action level or any other prescribed level of lead in a regulation issued under section 1412, including the concentrations of lead found in a monitoring activity.";

(2) in paragraph (2)—

(A) by redesignating subparagraphs (D) and (E) as subparagraphs (E) and (F), respectively; and

(B) by inserting after subparagraph (C) the following:

"(D) EXCEEDANCE OF LEAD ACTION LEVEL.—Regulations issued under subparagraph (A) shall specify notification procedures for an exceedance of a lead action level or any other prescribed level of lead in a regulation issued under section 1412.";

(3) by redesignating paragraphs (3) and (4) as paragraphs (4) and (5), respectively; and

(4) by inserting after paragraph (2) the following:

"(3) NOTIFICATION OF THE PUBLIC RELATING TO LEAD.—

"(A) EXCEEDANCE OF LEAD ACTION LEVEL.—Not later than 15 days after the date of an exceedance of a lead action level or any other prescribed level of lead in a regulation issued under section 1412, the Administrator shall notify the public of the concentrations of lead found in the monitoring activity conducted by the public water system if the public water system or the State does not notify the public of the concentrations of lead found in a monitoring activity.

"(B) RESULTS OF LEAD MONITORING.—

"(i) IN GENERAL.—The Administrator may provide notice of any result of lead monitoring conducted by a public water system to—

"(I) any person that is served by the public water system; or

"(II) the local or State health department of a locality or State in which the public water system is located.

"(ii) FORM OF NOTICE.—The Administrator may provide the notice described in clause (i) by—

"(I) press release; or

"(II) other form of communication, including local media.".

(b) CONFORMING AMENDMENTS.—Section 1414 (c) of the Safe Drinking Water Act (42 U.S.C. 300g-3(c)) is amended—

(1) in paragraph (1)(C), by striking "paragraph (2)(E)" and inserting "paragraph (2)(F)";

(2) in paragraph (2)(B)(i)(II), by striking "subparagraph (D)" and inserting "subparagraph (E)"; and

(3) in paragraph (3)(B), in the first sentence, by striking "(D)" and inserting "(E)".

Message

From: Taft, Jim [jtaft@asdwa.org]
Sent: 4/9/2016 3:10:23 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
CC: Greene, Ashley [Greene.Ashley@epa.gov]
Subject: June Swallow's Testimony for April 13th Hearing on Flint Crisis
Attachments: Swallow Testimony (Oral & Written) before House E & C Subcommittees (4-13-16) -- Single Spaced.docx

Good morning Peter --

I wanted to share with you June Swallow's testimony for next Wednesday's hearing on this topic. (June will be on the second panel, while I believe Joel is on the first.) I'm hopeful that there will be more light than heat at this hearing, but we'll see.

Please let me know if you have any questions or would like to discuss. (I'll be in Nashville at the ECOS meeting on Monday-Tuesday of next week, but can break away, if need be.) Thanks.

****

Jim Taft
Executive Director
Association of State Drinking Water Administrators
1401 Wilson Blvd.; Suite 1225
Arlington, VA 22209
Jtaft@asdwa.org
Phone: 703-812-9507

Association of State Drinking Water Administrators

WRITTEN AND ORAL TESTIMONY OF JUNE SWALLOW
BEFORE HOUSE ENERGY & COMMERCE COMMITTEE SUBCOMMITTEES:
ENVIRONMENT & ECONOMY AND HEALTH
April 13, 2016

Who We Are

My name is June Swallow. I'm the administrator of Rhode Island's drinking water program and President of the Association of State Drinking Water Administrators (ASDWA). ASDWA represents the women and men in the 50 states, territories, D.C., and the Navajo Nation who are responsible for administering the requirements of the Safe Drinking Water Act (SDWA) within their jurisdictions. I also served on the National Drinking Water Advisory Council's (NDWAC) working group that recommended long term changes to the federal Lead and Copper Rule. Those recommendations were forwarded to the EPA Administrator in December, 2015. Regarding the events of the past several months, I will primarily focus on lessons learned and the path forward.

Reflections on Flint; Lessons Learned

Flint was something of a "perfect storm" and we don't believe there are exactly comparable situations in other parts of the country. But it did expose vulnerabilities in our collective approach to providing safe drinking water that we very much want to shore up. We will learn the lessons of Flint and apply them across the country – so that we restore peoples' trust and, most importantly, help ensure safe drinking water at the tap for everyone.

Steps being Taken in the Near, Medium, and Longer Term

Deputy Assistant Administrator's Beauvais' letter to the 50 state commissioners provides a good overall template for our collective ***near and medium*** term actions: We want to be ensure that water systems are implementing (and states are overseeing) the current rule optimally and as intended. Where further guidance and clarifications are needed, those gaps need to be filled as quickly as possible. We will also work with our water systems to go *above and beyond* what the rule requires, such as transparently sharing information and sample results -- while working on long term rule changes that will further solidify some of those "above and beyond" steps.

For the ***long term,*** we support the recommendations of the NDWAC – the most important of which is to get the lead out: removing entire lead service lines and installing lead-free plumbing components. To accomplish that lofty, but, I believe, attainable goal, we need a national effort involving Federal, state, and local players -- as well as some non-traditional partners, such as the real estate community. We also support the other key NDWAC recommendations including, establishing a household action level for lead, setting up a lead information clearinghouse, and providing greater overall transparency and timeliness in sharing sampling results with customers.

We encourage EPA to move the revisions forward as quickly as possible and will actively assist on these important issues.

It's Not Just Lead – There are Many Other Challenges

We urge the committee, as it considers this matter and possible actions, to be mindful of the fact that implementing the SDWA is akin to playing 3-dimensional chess: rule requirements for the 90+ regulated contaminants must be met all of the time at all 155,000 water systems that states oversee -- most of which are small.. And we (EPA, states, and utilities) must also be mindful of a host of new and emerging threats from which we need to keep the public safe: such as perfluorinated compounds, hexavalent chromium, perchlorate, and algal toxins – to name but a few. As critically important as the challenge of addressing lead in drinking water is -- we may not shift all of our time, attention, and resources -- thus creating other vulnerabilities.

The Multi-Barrier Approach

We also need to be mindful of what we call the multi-barrier – source-to-tap – approach to our collective task. To best protect public health, the sources of drinking water need to first be protected through a variety of statutes, authorities, and programs -- including the authorities provided under the Clean Water Act as well as USDA's various programs. Surface and ground waters used by water treatment facilities need to be adequately protected from point and nonpoint sources of pollution.

The Criticality of Partnerships: State-EPA and the State-Utility

And, we're most successful in our collective efforts when EPA, states, and local governments work together in partnership -- respecting and fulfilling our various roles and responsibilities. States remain firmly committed to these partnerships: we believe they've been mutually beneficial and essential to our collective efforts to protect public health.

Support for both Physical and Human Infrastructure; What Congress Can Do

Finally, I'd like to mention the importance of support for both physical and "human infrastructure." You're well aware of the issue of aging drinking water infrastructure – including lead service lines -- and the costs and challenges of replacement. We appreciate the various bills that are seeking to address this need. Managers of state drinking water revolving loan fund programs stand ready to help in that task. But, there's also a human infrastructure shortfall in states of which you need to be aware. State drinking water programs need far greater support than they receive now. Congressional support for the principal Federal appropriation for state drinking water programs – the PWSS grant -- has been level funded at about $2 million per state per year for the past decade. To address increasing responsibilities and assure adequate oversight, at least twice that amount is needed for states.

In summary, we are eager to apply the lessons learned from Flint, while being vigilant about all of the other challenges associated with providing safe drinking water at the tap, in collaboration with our Federal and local partners – and with Congressional support.

Message

From: Keli Jackson [KJackson@awwa.org]
on behalf of David LaFrance [dlafrance@awwa.org]
Sent: 4/5/2016 4:58:34 PM
Subject: Journal AWWA - Open Channel
Attachments: 0416_openchannel.pdf

Importance: High

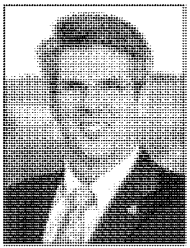
Good afternoon:

Attached, please find the Open Channel column from the April, 2016 issue of *Journal AWWA*.

Thank you

Keli Jackson
Executive Administrator
American Water Works Association
Direct 303.347.6135 | **Fax** 303.795.1440
kjackson@awwa.org | www.awwa.org

DAVID B. LaFRANCE, CHIEF EXECUTIVE OFFICER



Restoring Faith

I cannot imagine what it must be like to live in Flint, Michigan. To be a parent there. To lose faith in the simple ritual of safely drinking water from the kitchen faucet.

Twenty-five years ago the US Environmental Protection Agency (USEPA) published the Lead and Copper Rule (LCR) to control lead and copper in drinking water. The reason for the rule is that lead and copper negatively affect our health—that much is clear. What is not widely understood outside of the water treatment and regulatory communities is that the LCR's action level is not a health-based limit but rather a trigger for water providers to pursue better corrosion control. There are other parts of the LCR that are confusing as well, but the simple fact is that as long as there are lead pipes in the ground or lead plumbing in the home, some risk remains.

The National Drinking Water Advisory Council's Lead and Copper Rule Working Group agrees. Its 2015 recommendations to USEPA about revisions to the LCR include, among other things, proactive lead service line replacement programs, robust public education programs on lead service lines, strengthening corrosion control treatment, and modifying monitoring requirements. The report is clear that achieving the recommendations depends on "renewed commitment, cooperation and effort by government at all levels and by the general public," and that financing these recommendations will likely raise questions of affordability and social justice.

AWWA has been doing its part to help its members understand the complexities of lead in water. By far one of the best collections of lead-related resources is AWWA's newly created Lead Resource Community, which can be found at www.awwa.org/lead. Here you will not only find AWWA resources and USEPA's guidance on best management practices, you will also find information on Flint, news feeds, and research by other organizations such as the Water Research Foundation.

AWWA and its Michigan Section have also worked with officials in the state of Michigan to restore safe water to the residents of Flint. We have made available technical materials such as our management standards on treatment plant optimization and distribution system operations and maintenance. And we have connected Michigan's decision-makers with experts in water quality, treatment plant start-up, and utility finance. Access to these resources—both technical and professional—is helpful but admittedly not a panacea.

Keeping the people of Flint and other similar communities in mind, it is time to fully address the challenges of getting lead out of water. As published in this issue of *Journal AWWA*, the peer-reviewed article titled "National Survey of Lead Service Line Occurrence" by David A. Cornwell, Richard A. Brown, and Steve H. Via estimates that there are a total of 6.1 million lead service lines—either full or partial—currently located within the community water systems (CWSs) of the United States. The good news is that this latest estimate is down from the estimated 10.2 million in place at the time the LCR was passed in 1991. So, within the limits of the analysis, it appears some progress has been made. Still, approximately 30% of the nation's CWSs still have lead service lines, and those systems are providing water to an estimated 15 million to 22 million people. As the magnitude of this challenge reveals itself, think of this: if you assume that replacing these lead service lines will cost $5,000 per line, the price tag to replace the lead service lines is a staggering $30 billion.

How might you systematically begin addressing this concern? To start, if you have not already done so, develop a communication plan to explain to your customers the risks of lead in water, what your utility is doing to manage the risk, and what your customers can do to protect themselves. Next, review existing information and practices you have in place to locate and track lead service lines in your service area. Finally, if lead service lines exist in the communities you serve, develop a strategy and timeline to replace them.

Among the most debated questions in solving the lead challenge is, who bears the cost? The concept of shared responsibility—especially because service lines are often partially owned by the customer and partially owned by the utility—will be a key consideration in addressing who pays. In all likelihood the concept of shared responsibility will take on a variety of forms with a variety of possible solutions. The task certainly is not simple, but it is solvable.

If you share the goal that no one should have to question the safety of water at the tap, then as a society and as water leaders, we should seize this moment. There will be no better time to develop workable solutions for getting the lead out, protecting public health, and restoring faith in drinking water.

http://dx.doi.org/10.5942/jawwa.2016.108.0068

If you have any comments or concerns, please write me at OpenChannel@awwa.org.

Message

From: NRWA's Rural Water Wire [wire=nrwa.org@mail83.sea21.rsgsv.net]
on behalf of NRWA's Rural Water Wire [wire@nrwa.org]
Sent: 4/13/2017 3:09:49 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: [SPAM] NRWA's Rural Water Wire for 04/13/2017

Your weekly news update from around the water industry

View this email in your browser
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Rural Water Uses Pipe-Freezing Tech to Assist Nebraska Town

AXTELL, Neb. – When Mike Stanzel arrived to assist the Village of Axtell with a leak, he never expected that after scheduling around a high school basketball tournament and closing 13 valves the leak was no closer to repair. Ultimately, the repair required the excavation of a service line and the use of a line... Read more »

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Attend the WaterPro Conference, Sept. 18-20 in Reno, Nev. www.waterproconference.org

NRWA News

Rural Water Uses Pipe-Freezing Tech to Assist Nebraska Town
Apr 12, 2017 07:05 pm
Read More

Registration Open for the 2017 WaterPro Conference, Sept. 18-20 in Reno, Nev.
Apr 04, 2017 10:10 am
Read More

Watch Dennis Sternberg of Arkansas Rural Water Testify to Senate Committee
Mar 29, 2017 01:59 pm
Read More

Hearings Show Nominated

Technical Assistance

Rural Water Uses Pipe-Freezing Tech to Assist Nebraska Town
Apr 12, 2017 07:05 pm
Read More

Borough Seeks Help from Rural Water After Equipment Failure Floods Water Plant
Mar 23, 2017 08:53 am
Read More

Utility Turns to California Rural Water to Inform New Board and Manager
Mar 15, 2017 07:00 pm
Read More

West Virginia Rural Water Assists School for the Deaf and Blind After Water Break
Feb 15, 2017 01:52 pm
Read More

West Virginia Rural Water Deploys Mobile Treatment Plant to Assist Community Without Water
Jan 26, 2017 09:30 am
Read More

Rural Water Policy Advisory (4/10/2017)

Apr 09, 2017 07:14 pm

Rural Water Policy Advisory [4/10/2017]

Senate Committee Passes Rural Water Clean Water Technical Assistance Bill, S. 518 (U.S. Senate).

Final Cosigners of Congressional Rural Water USDA Support Letter: Representatives Hanabusa (HA) and Katko's (NY) rural water Dear Colleague letter was finalized last week. Cosigners include: Representatives DelBene (WA), O'Halleran (AZ), Tonko (NY), McKinley (WV), Loebsack (IA), Keating (MA), Welch (VT), Walz (MN), Hastings (FL), Heck (WA), Cleaver (MO), Kildee (MI), Speier (CA), Kihuen (NV), Soto (FL), Collins (NY), Larsen (CT), Maloney (NY), Tenney (NY), Bordallo (GU), Peterson (MN), Moulton (MA), Tsongas (MA), Kennedy (MA), Faso (NY), Ellison (MN), Shea Porter (NH), Bobby Scott (VA), McGovern (MA), Neal (MA), Gottheimer (NJ), Plaskett (VI), Vela (TX), Kelly (PA), Dingell (MI), Garamendi (CA), Lujan Grisham (NM), Clyburn (SC), Hartzler (MO), Kind (WI), Kuster (NH), Bustos (IL), Blumenauer (OR), Gabbard (HA), Rochester (DE), Lawrence (MI), Crawford (AR), Raskin (MD), Kilili Camacho Sablan (MP), Richmond (LA), Cramer (ND), Graves (MO), Chaffetz (UT), DeSaulnier (CA), Rouzer (NC), Adams (NC), Jones (NC), Butterfield (NC), Sewell (AL), and Cheney (WY).

NRWA Regulatory Committee Activity: To enhance communication and advocacy, the committee's new chairman, Paul Fulgham (UT), has scheduled a monthly conference call for the committee. The first conference call was held on March 28th. During the deliberations, the committee adopted the following six motions:

1. Draft statement to EPA clarifying NRWA's LCR position that compliance monitoring for the LCR should be taken with the distribution system (within the portion of the delivery system that is owned by the water utility, not within privately owned plumbing) – and that NRWA support in-home tap sampling; however, that should not be used for LCR compliance.
2. Approve draft letter to EPA nominating two drinking water regulations for reform under the "Presidential Executive Order on Reducing Regulation and Controlling Regulatory Costs."
3. Draft letter to EPA and Congress urging regulatory reform on all existing NRWA policy recommendations within the Safe Drinking Water Act (SDWA) and Clean Water Act including a new process for determining affordability/variances and identification of unreasonable risk to health levels.

4. Submit comments for NRWA Risk Management Plans under EPA's new open rulemaking comment period and include new emphasis on limiting chlorine gas threshold to not less than 800 pounds.
5. Craft letter to EPA urging the Agency to interpret the Clean Water Act State Revolving Fund to allow for eligibility of non-profit, member-owned (special districts) wastewater utilities.
6. Craft letter to EPA urging the Agency to reverse their Unregulated Contaminant Monitoring Rules (UCMRs) policy that changed public notification requirements under UCMR to apply to "detects" versus "risk levels" as had been defined in previous rules.

President Wants Two Billionaire Developers to Lead Infrastructure Plans: In a recent interview with the *New York Times*, the President said he wants Richard LeFrak and Steven Roth to lead a commission that will make decisions on infrastructure projects (NYTimes). The President said he plans to attach it to either a tax reform bill or a second try at a health care bill in an effort to make those bills easier to pass.

USGS Finds Neonicotinoids in Treated Drinking Water for the First Time in Iowa (news).

Supreme Will Not Delay Litigation on Waters of the U.S. Rule While Trump EPA Rewrites the Rule (news).

Flint's Congressman Introduces Legislation to Lower EPA Lead Action Level to 5PPB: On Thursday, Congressman Dan Kildee (MI) introduced comprehensive legislation that would require an update to the Lead and Copper Rule (LCR) within nine months, including lowering the action level of lead permitted in drinking water from its current level of 15 parts per billion (ppb) to 10 ppb by 2020, and to 5 ppb by 2026 (Rep. Kildee).

Trailer Park Wins Best Water in Nebraska: Lexington trailer park wins best tasting water award – declared the best tasting in Nebraska at an annual conference of the Nebraska Rural Water Association (news).

"At Trump's EPA, Going to Work Can Be an Act of Defiance": *"It is very hard to be here right now,' said a senior EPA official who has been with the agency for 30 years. Even Bill Ruckelshaus, who was appointed by Richard Nixon to be the first EPA chief and then recruited by Ronald Reagan to restore it when the public grew angry that clean air and water were slipping away on Reagan's watch, said he had never seen anything like the tumult the agency faced now. EPA employees have been heartened by the cookies some well-wishers have sent, including* *individual notes written by scores of Americans appreciative of their work and unhappy to see them under siege (LA Times)."*

Contact: Mike Keegan, Policy Analyst <keegan@ruralwater.org>

(Washington, DC)

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The National Rural Water Association *is the country's largest public drinking water and sanitation supply organization with over 30,000 members. Safe drinking water and sanitation are generally recognized as the most essential public health, public welfare, and civic necessities*

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Message

From: Roberson, Alan [aroberson@asdwa.org]
Sent: 4/5/2017 4:21:43 PM
To: Lopez-Carbo, Maria [Lopez-Carbo.Maria@epa.gov]
CC: Grevatt, Peter [Grevatt.Peter@epa.gov]; Thompkins, Anita [Thompkins.Anita@epa.gov]; Bridget O'Grady [bogrady@asdwa.org]; dosterhoudt@asdwa.org; Deirdre Mason [dmason@asdwa.org]
Subject: ASDWA's comments on EPA's Draft Strategic Plan
Attachments: ASDWA Comments on Draft Stategic Plan for Lead Notifications under WIIN - Final.pdf

Maria (and Peter and Anita), enclosed are ASDWA's comments on *"DRAFT: Strategic Plan for Targeted Outreach to Populations Affected by Lead - Water Infrastructure Improvements for the Nation (WIIN) Act"*. ASDWA received a lot of input from various states on this draft which shows the importance of this issue for states' drinking water programs. We look forward to receiving the Final Strategic Plan.

As usual, if you have any questions about these comments, please feel free to give me a call. Alan

****
J. Alan Roberson, P.E.
Executive Director

Association of State Drinking Water Administrators (ASDWA)
1401 Wilson Blvd. - Suite 1225
Arlington, VA 22209

Office: (703) 812-9507

ASDWA

April 5, 2017

Ms. Maria Lopez-Carbo
U.S. Environmental Protection Agency
Office of Groundwater and Drinking Water
1200 Pennsylvania Ave., NW.
Washington, DC 20460

To Ms. Lopez Carbo:

In response to the recently released *"DRAFT: Strategic Plan for Targeted Outreach to Populations Affected by Lead – Water Infrastructure Improvements for the Nation (WIIN) Act"*, the Association of State Drinking Water Administrators (ASDWA) would like to offer its comments on this Draft Strategic Plan. ASDWA supports and represents the collective interests of the states, territories, and the Navajo Nation in their administration of national drinking water program requirements within their states or territories. ASDWA supports the regulatory processes contained in the 1996 Amendments to the Safe Drinking Water Act (SDWA), including the WIIN amendments to the SDWA.

Protection from potential exposure to lead from all routes of exposure, including drinking water, is important to protecting public health. The WIIN amendments to the SDWA provide for public notification outside of the traditional public notification requirements from systems' compliance monitoring. Therefore, some caution is needed in developing the final strategic plan to ensure that states' responsibilities are both reasonable and achievable. Developing reasonable expectations for the states' role in these notifications is particularly important as the WIIN language does not require, but only recommends, state actions. This statutory language makes these notification requirements unique under the SDWA regulatory implementation framework. ASDWA supports notifying homeowners of the results of lead sampling at their residence, but the WIIN notification requirements are both unique and challenging.

ASDWA has the following detailed comments that follow the steps to disseminate information to households listed in the Draft Strategic Plan:

EPA Develops or Receives Data –

- ASDWA recommends the development of a documentation template for the sample collection and analysis.
- For item I.c (sampling protocol), ASDWA recommends that the Final Strategic Plan provide clarity on the required information, i.e., first draw, profile, etc. Additionally, EPA's recommended sample protocol should be the same as the protocol for a compliance sample under the Lead and Copper Rule:
    - 1 liter sample size
    - First-draw sample with a minimum of 6-hour stagnation
    - Sample is from a cold water tap regularly used for drinking/cooking
    - Sample is collected in an appropriate sample bottle and is properly preserved

  - Sample must be analyzed within the method holding time by a certified laboratory using an approved drinking water method
- ASDWA recommends that the required documentation should be expanded to include information on:
  - ✓ contact information for the sampler, including the mailing address, phone number and email (if available)
  - ✓ sample volume
  - ✓ sample results
  - ✓ copy of the laboratory report that includes the information to show that the analysis was conducted by a certified drinking water laboratory
  - ✓ sample tap location (kitchen sink, bathroom sink, drinking fountain, etc.)
  - ✓ time of sample collection
  - ✓ type of building sampled (single family residential, multi-family residential, commercial, etc.) and whether the building was occupied at the time or sampling (or not)
  - ✓ year when the building was constructed (if known and if a lead service line serves the building (if known)
  - ✓ type of POU/POE installed if the answer to the 'do you have' question is yes
  - ✓ any recent changes to the plumbing (new faucet, etc.).
- ASDWA recommends that the listed items in the narrative agree with all items listed in Appendix B.
- ASDWA recommends that EPA be allowed two weeks from date of receipt of information to verify the data and to decide if further action is needed.
- ASDWA recommends that EPA develop a plan to handle invalidated sample data that includes what type of information would be needed to invalidate a sample, and the Final Strategic Plan should include provisions for this circumstance.

EPA Forwards Data to Public Water System (PWS) and Primacy Agency –

- ASDWA recommends simplifying this protocol, so that once EPA verifies the data that has been submitted, appropriate educational materials are distributed to the affected households with a "cc" notation to the PWS that serves the household and to the Primacy Agency that oversees the PWS. This is a much faster method to ensure that affected households receive appropriate information in the most efficient manner. Such direct action by EPA also clearly better supports the public health protection goal of the SDWA. Finally, this alternative approach also eliminates the potential for failure to act in a timely manner by all parties.
- ASDWA recommends that not more than 72 hours should pass between the time that EPA validates the data and notification is provided to both the PWS and Primacy Agency. However, a couple of qualifiers are needed with this recommendation of 72 hours:
  - This timeframe may not be adequate if the time clock starts on a Friday afternoon or during a holiday so some flexibility on timeframes may be necessary.
  - 72 hours is adequate for dissemination if fulfilled by mailing via standard U.S. Postal Service but may not be adequate if by hand (door-to-door) or certified mail. If the dissemination is not considered complete until the household actually receives the information, then additional time will be needed and flexibility will need to be provided.
- ASDWA recommends that EPA revise the narrative in step 2 in the Final Strategic Plan to acknowledge that all data and information be provided to BOTH the PWS and Primacy Agency at the same time since the PWS is indicated as being in the lead role. The Primacy Agency acts only if the PWS fails to do so. Not all Primacy Agencies may want to preempt the PWS in taking this action.

- If the Primacy Agency will need to include EPA in any correspondence with the PWS, EPA needs to delineate which office (Region or Headquarters) and the person that correspondence should be sent.

The Owner/Operator of the Public Water System Shall Disseminate –

- ASDWA questions EPA's suggested considerations for PWS delivery timeframe. The PWS size and capacity should have no effect on the needed timeframe or ability of a PWS to provide information to specific households. ASDWA recommends that the timeframe in the Final Strategic Plan should be same for all PWSs.
- ASDWA recommends that not less than 72 hours from time of PWS notification to delivery of information to affected households is an appropriate timeframe.
- The option to disseminate the notification by email to household(s), with follow-up by mail or hand-delivery would be useful and should be mentioned in the Final Strategic Plan.
- ASDWA recommends that EPA provide the PWS and Primacy Agency with the specific "clear explanation of the potential adverse effects on human health of drinking water that contains a concentration of lead that exceeds the lead action level under 40 CFR §141.80(c)." This small but significant addition would ensure that affected households receive the best available information on lead exceedances and potential health impacts.
- ASDWA recommends that a simple "certification" that acknowledges date of receipt of information regarding household lead exceedances; date of information distribution to affected households; and identification of delivery method (door to door, email, letter etc.) is appropriate to send to EPA as confirmation of actions taken by the PWS.

EPA Consultation with State Governor –

- ASDWA notes that, in an ideal world, the state Governor/Primacy Agency have little or no involvement in the household exceedance notification process. The PWS, which has the direct connection with the potentially impacted household, makes the appropriate notification.
- ASDWA recommends that EPA include the Primacy Agency in any initial outreach to a state Governor. This courtesy allows the Governor time to be apprised of state actions to date and be well informed when going into consultation with EPA.
- How will EPA know if the PWS has not provided the notification? How would the PWS prove it has met the notification requirements to EPA and the Primacy Agency?
- ASDWA notes that the underlined narrative in Step 4 does not suggest that the state may intervene should the water system fail to act. It suggests that the water system failure triggers direct EPA intervention with the Governor of the state. ASDWA understood that, as described in Step 3(iv), the Primacy Agency may act to provide information to the affected household before any consultation with the Governor is required. The final Strategic Plan should provide a clarification.

State Governor/State Primacy Agency to Disseminate Information –

- ASDWA recommends that EPA include the Primacy Agency in any consultation with a state Governor. Simply put, Primacy Agencies should be at this table to provide perspective – particularly if a 24-hour dissemination clock is in play.

EPA to Disseminate Information –

- ASDWA recommends that, in the interest of public health protection information reaching affected households in a timely manner, EPA meet the same 72-hour response timeframe for information dissemination – and concomitant certification to the Primacy Agency that the information has been provided to affected households – as that required of PWS.

Appendix A

- Section (5)(B)(i) of WIIN states that the Administrator shall require an appropriate employee of the Agency to forward the data and information on the sampling techniques used to obtain the data, to the owner or operator of the public water system and the state in which the affected household is located. However, the header line (in italics) in section 2 states that EPA will forward the data and information on any sampling techniques to the primacy agency in which the affected household is located. Section 2 further states that EPA will contact the State's Drinking Water Administrator and that the State's Drinking Water Administrator will contact the PWS. This appears to conflict with the WIIN Act as written and some clarification in the Final Strategic Plan is warranted

Appendix B

- ASDWA supports the development of a template – this is critical to ensure consistent notifications under this new notification protocol.

On a separate but related issue that is as important to our members, ASDWA is in the process of developing input to EPA (as co-regulators) on the new public notification requirements in WIIN for a lead action level exceedance (ALE). The 24-hour notification timeframe in WIIN presents challenges to both states and public water systems, so that issue warrants further discussion and a separate letter to EPA in the future.

Thank you for your consideration of these comments for the development of the final strategic plan. As noted above, ASDWA continues its willingness to work with EPA on all aspects of rule development and implementation to ensure public health protection is optimized, and states' roles and responsibilities are appropriately considered. Please contact me at 703-812-9507 or aroberson@asdwa.org if we can provide additional information or if any clarification of these comments is needed.

Sincerely,

J. Alan Roberson

J. Alan Roberson, P.E.
Executive Director

Cc: Peter Grevatt – USEPA OGWDW
Anita Thompkins – USEPA OGWDW

Message

From: Emily Frary [emilyfrary@utah.gov]
Sent: 3/29/2016 10:05:38 PM
To: Patti Fauver [pfauver@utah.gov]; Alan Matheson [amatheson@utah.gov]; Ken Bousfield [kbousfield@utah.gov]; Bahrman, Sarah [Bahrman.Sarah@epa.gov]; jtaft@asdwa.org; dosterhoudt@asdwa.org; Kahn, Lisa [Kahn.Lisa@epa.gov]; Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: Utah's response to Joel Beauvais letter
Attachments: Utah Response .pdf

Please find Utah's response to Joel Beauvais letter attached.

Thank you,

--

Emily Frary | Environmental Scientist II
Phone: 801.536.0070

State of Utah
GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF DRINKING WATER
Kenneth H. Bousfield, P.E.
Director

Joel Beauvais
Deputy Assistant Administrator
Office of Water
US EPA
Washington, D.C. 20460

Dear Mr. Beauvais:

Utah agrees there is no higher priority than protecting public health and ensuring the safety of our nation's drinking water. Utah is proud to have had and retained primary responsibility for the implementation and enforcement of drinking water regulations since 1979. Our Drinking Water team has worked hard to uphold the partnership agreement we have with Region 8 EPA. The recent events in Flint, Michigan and other U.S. cities have heightened Utah's commitment to review implementation practices and policies to strengthen our safe drinking water programs.

Specifically, in answer to your request for information, Utah is completing the following near term actions:

<u>Near Term Action #1</u>:* *Confirm that the state's protocols and procedures for implementing the LCR are fully consistent with the LCR and applicable guidance

It is important to understand the LCR has been effective for over 23 years and has been revised twice. The rule has also transitioned between at least 6 different staff as the assigned Rule Manager. With all the changes in staff and regulatory language making implementation a "moving target" over time, Utah has done its best to comply with all of the requirements and will continue to assimilate all the new policy and guidance into our practices.

Over the last several years, Utah has reviewed and is documenting response procedures and protocols to various management scenarios, including: changes in treatment, addition of new sources, failure to monitor, and ALE response. Utah is also tracking corrosive water sources by querying pH and Langelier Index data.

<u>Near Term Action #2</u>:* *Use relevant EPA guidance on LCR sampling protocols and guidance for identification of Tier 1 sites (at which LCR sampling is required to be conducted).

Utah initialized the sanitary survey as the mechanism for review of the sample site plans and continued to review them triennially through calendar year 2006. As new PWSs were added, appropriate guidance was provided. We have reviewed the newest guidance provided by EPA OGWDW and will provide the guidance to Utah water systems and post it on our website.

Suggestion: It seems likely there will be regulatory changes to sample site plan requirements. Utah suggests providing the most stringent proposed version of the new requirements as soon as possible. We believe that many systems and States will be looking at this aspect of implementation and it would save resources for everyone if the criteria used now meet or exceed any future regulatory requirement.

<u>Near Term Action #3</u>:* *Post on your agency's public website all state LCR sampling protocols and guidance for identification of Tier 1 sites (at which LCR sampling is required to be conducted).

Utah has historically made available sampling protocols and guidance upon request and will post the newest sampling protocols on our website.

Suggestion: Utah has noticed differences in sampling procedure from lab to lab. It would be beneficial for EPA to produce a standardized universal sampling procedure for all labs to follow.

<u>Near Term Action #4</u>: Work with PWSs – with a priority emphasis on large systems – to increase transparency in implementation of the LCR by posting on their public website and/or on your agency's website the following:

- ***The materials inventory that systems were required to complete under the LCR, including the locations of lead service lines, together with any more updated inventory or map of lead service lines and lead plumbing in the system.***

Utah will be reaching out to the larger systems where this requirement is applicable and will be working with them to find the historical data, update and reevaluate the data, and to encourage them to post the data to increase compliance transparency.

These data are over twenty years old and likely reflected in paper files or, in many cases, archived.

- ***LCR compliance sampling results collected by the system, as well as justification for invalidation of LCR samples.***

Utah stores a majority of its lead and copper data online between SDWIS and eDocs. Labs electronically report sample data, and systems email/mail in sample results that are entered into SDWIS and scanned. Individual sample results are entered and not just the summaries. Sample invalidation documentation is being improved. Under current practice, when a sample is invalidated, the utility must describe why in writing, and the Utah DDW will respond in written form. The written documents are stored in eDocs and the invalidated sample is documented by a note in the comment section of the sample in SDWIS. Utah DDW has documented the historical invalidated samples for ALE systems in EPA's spreadsheet.

<u>Near Term Action #5</u>: Enhance efforts to ensure that residents promptly receive lead sampling results from homes, together with clear information on lead risks and how to abate them, and that the general public receives prompt information on high lead levels in drinking water systems.

Utah has been implementing the consumer notification requirements to ensure homeowners receive the results of lead and copper samples collected in their homes. We will be posting on our website the public education information.

In response to the increased awareness of lead in drinking water since Flint, Utah has listed all community water systems 90th percentiles on our website. The Action Level Exceedances are included on this list and the list will be updated biannually. The Utah website is being updated with additional public education information to answer consumer concerns. Utah has also been working with EPA to provide status reports and planned actions for ALE's.

Utah agrees wholeheartedly that while there is a spotlight on lead in drinking water, we cannot forget or ignore that protection of the nation's drinking water involves both legacy and emerging contaminants. Utah welcomes the dialogue on strategies and actions to improve the safety and sustainability of our drinking water systems, including:

- Ensuring adequate and sustained investment in, and attention to, regulatory oversight at all levels of government;
- Using information technology to enhance transparency and accountability with regard to reporting and public availability of drinking water compliance data;
- Leveraging funding sources to finance maintenance, upgrading and replacement of aging infrastructure, especially for poor and overburdened communities; and
- Identifying technology and infrastructure to address both existing and emerging contaminants.

Utah is proud of our focus on ensuring a safe and sufficient supply of water to Utah citizens and stands ready to improve implementation strategies of all contaminants to achieve this end. Please do not hesitate to contact me or Ken Bousfield, Director of the Division of Drinking Water, at 801-536-4207 or kbousfield@utah.gov.

Sincerely,

Alan Matheson

Cc: Peter Grevatt, Director, Office of Ground Water & Drinking Water
Lisa Kahn, Region 8 EPA
Sarah Bahrman, Region 8 EPA
Jim Taft, ASDWA
Darrell Osterhoudt, ASDWA

Message

From: NRWA's Rural Water Wire [wire=nrwa.org@mail161.suw121.mcdlv.net]
on behalf of NRWA's Rural Water Wire [wire@nrwa.org]
Sent: 7/5/2018 3:13:43 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: NRWA's Rural Water Wire for 07/05/2018

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Independence Day Celebrations Would Look Much Different Without Rural Water

Today, people across the United States will celebrate the founding of our nation, most with some combination of barbecue, parades, flags, family and fireworks. The Rural Water Family prides itself on both its love of country and dedication to community. The efforts of the water industry often go overlooked, but before this holiday season, take... Read more »

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Illinois Rural Water Circuit Rider

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Rural Water Policy Advisory [7/2/2018]

Jul 02, 2018 08:26 pm

Senate Passes Farm Bill with "ALL" Rural Water Priorities: On Thursday, the Senate passed its version of the Farm Bill. On September

28, 2017, Kansas Rural Water Association's Executive Director Elmer Ronnebaum testified before the Senate Farm Bill committee and urged the inclusion of provisions authorizing Rural Water Circuit Riders, Source Water Technicians, Wastewater Technicians, and Rural Development Grants & Loans (C-SPAN). All these Rural Water provisions were included in the Senate passed bill. The House version of the legislation passed narrowly the previous week. The bills now move forward to a conference between the two chambers to attempt to reach common ground before a House-Senate agreement can be presented to the President for his signature.

All Senators Urged to Co-sign Barrasso Letter to Fix EPA Technical Assistance Funding: The final draft of Senator Barrasso's letter has been released (link). As the letter states, this is an effort to have "EPA to adhere to the Congressional intent of the Grassroots Rural and Small Community Water Systems Assistance Act (PL 114-98). Under the law, EPA must give preference to both the organizations and the type of assistance that small and rural communities find most beneficial and effective when awarding drinking water technical assistance grants... implementation of PL 114-98 would soon reestablish on-site technical assistance in our states..."

C-SPAN Interview, Flint (MI) Pediatrician Mona Hanna-Attisha Book, "What the Eyes Don't See": Doctor Mona Hanna-Attisha details her efforts to provide scientific evidence that children in Flint, Michigan were being exposed to lead poisoning through the water supply (watch on C-SPAN). She mentions the following points in the interview: she looks up to Erin Brockovich; one's zip code is a predictor of life success; she has a heightened antenna for injustice, and was a young activist against social injustice; people two generations ago had high levels of lead in their blood but there are much lower levels in the general population now; incredible new science tells us, however, that very low levels of lead in children cause the steepest decline in cognition; there were race issues with local governmental emergency managers in Michigan; she told moms the water was safe during crises; EPA programs fail to keep up with the incredible new science; EPA was denying science, and science was speaking truth to power; a Flint foster home was tested at 5,000 ppb for lead; she is concerned with new Administration; the EPA Lead and Copper rule is weak; we need mandated lead service line replacement; she recommends lowering the EPA action level; etc.

New Hampshire Senators Call on EPA to Take Immediate Action on PFAS in Drinking Water: The Senators are calling on EPA Administrator

Scott Pruitt to take immediate action to designate PFAS as 'hazardous substances,' which would make PFAS covered under the EPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 102, and require responsible parties to be held accountable for any future release (Senators' statement).

E. Coli Outbreak that Killed Five Traced to Canal Water in Arizona (NBC).

Local Governments Urge Illinois Governor to Veto Bill to Help Water Privatization: State senators and mayors are urging Governor Rauner to veto an amendment to the Illinois Water Systems Viability Act because the provisions are bad for consumers and a boon for private water companies. A consumer watchdog group said the bill will allow private companies to grow unchecked at the expense of Illinois residents. The bill would remove a 7,500-connection cap on the size of water systems that private companies can buy (ChicagoTribune).

Venezuela Drinking Water Dystopia: Army controls drinking water spigots; distribution system falls apart; water becomes a luxury; people back up to springs for water; major access points in the capital of 5.5 million people are now run by soldiers or police; subsidized water has become a source of profit for those who control and deliver it; residents must haul containers to their homes for cooking and bathing; most people in Caracas get 30 minutes of water mornings and nights, igniting a mad rush to leave work or social gatherings to shower, wash and clean; and mosquito-spread diseases like dengue fever and Zika have multiplied as the insects lay eggs on people's buckets or rain barrels (Bloomberg News).

Brits Told to Shower in FOUR MINUTES and to Stop Using Hoses (UK Sun).

The National Rural Water Association is the country's largest public drinking water and sanitation supply organization with over 30,000 members. Safe drinking water and sanitation are generally recognized as the most essential public health, public welfare, and civic necessities.

Archives: past editions of this newsletter are available on the internet (link).

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Sent: 3/2/2017 5:57:19 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: March 2017 Journal AWWA [WARNING: DKIM validation failed]

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Journal - American Water Works Association

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March 19–22	Sustainable Water Management Conference New Orleans, La.
June 11–14	Annual Conference & Exposition (ACE17) Philadelphia, Pa.

AWWA hosts many water-related events every year. A full listing appears online.

Message

From: Matthew Holmes [Matt@nrwa.org]
Sent: 12/20/2016 6:03:22 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: Re: ORWA NEWS BULLETIN: Response to USA Today article

Thanks Peter! We will get it fixed. Talk to you tomorrow,

Matt

Matthew Holmes
Deputy CEO
National Rural Water Association
580-736-1898 | www.nrwa.org

On Dec 20, 2016, at 10:17 AM, Grevatt, Peter <Grevatt.Peter@epa.gov> wrote:

> Matt, I'd recommend you check the 3rd sentence in the first bullet of Mike's statement below. I believe he omitted the word 'water' from the end of that sentence! Looking forward to speaking with you tomorrow.
>
> **From:** Ohio Rural Water Association [mailto:orwa@ohioruralwater.org]
> **Sent:** Tuesday, December 20, 2016 10:42 AM
> **To:** Grevatt, Peter <Grevatt.Peter@epa.gov>
> **Subject:** ORWA NEWS BULLETIN: Response to USA Today article

Like

The ORWA News Bulletin: News and Information from the Ohio Rural Water Association

Ohio
RURAL WATER
ASSOCIATION
NEWS

December 20, 2016

Dear ORWA Members and friends,

The USA Today very recently released an article that is critical of small and rural water systems. In our opinion, the article has many misleading or incorrect statements.

Here are two statements that the article touts:

"4 million Americans could be drinking toxic water and would never know"

"Broken system traps rural Americans with poisoned or untested water"

While the USA Today article focuses on lead compliance for an example, it tries to build a case that training, professionalism, enforcement, and justice are all lacking for small systems in comparison to larger utilities.

We at ORWA are very proud of the work we do. These stories are trending on social media right now, and this communication to you serves as our response and assurance that we do not take this criticism lightly.

Here is a link to the USA Today article: Click Here

To keep you fully informed, below you will find several responses from our NRWA representative in DC.

Again, we reiterate that all of us at ORWA strive for quality. We want to assure you that our circuit riders and waste water technicians do an outstanding job assisting small systems and operators.

Sincerely,

Dustin Parker,

President ORWA Board of Trustees

Kevin Strang,

ORWA Executive Director

Responses 12/14/2016

Mike Keegan, NRWA Analyst
(keegan@ruralwater.org)

USA Today's (12/13/2016) drinking water feature, *"Broken System Traps Rural Americans with Poisoned or Untested Water,"* does report some troubling examples of public drinking water supply problems. However, the reporters use flawed reasoning and false premises in their interpretation of federal compliance data to confuse the public on the safety of their drinking water and who is actually keeping the public's water safe.

In drawing any conclusions from the report, the public should know the following:

- ? <!--[if !supportLists]--><!--[endif]-->**The public is the guarantor of the safety of their public drinking water through their local governments. The public owns and operates their public drinking water supply and is responsible for its safety. There is no commercial enterprise (profiting) in public drinking water service and any community can adopt any policy or action needed to protect their drinking. Every community wants to provide safe water and meet all drinking water standards. After all, local water supplies are operated and governed by people whose families drink the water every day and people who are locally elected by their community. Some of the smallest communities rely on volunteers to operate their local drinking water supplies. Every day, someone who works for your local community is making second-to-second decisions about adding essential purifying chemicals, killing pathogens, watching for changes in complex water delivery systems, and keeping your family's drinking water safe because that is what** they want to do, not because a regulation makes them do it.

? <!--[if !supportLists]--><!--[endif]-->The public drinking water supply in rural and small town America is actually very safe. Concerned public citizens should find out exactly what was the cause of any violation in their community in order to judge this for themselves. Federal non-compliance, while regrettable, does not indicate that there is lead in the public's drinking water supply. The vast majority of violations are for procedural requirements under the rule such as proper monitoring techniques (which are very complicated and require local residents to properly follow complicated procedures), missed monitoring samples, late submission of samples, lab errors, etc. Monitoring violations do not correspond to a finding of lead in the drinking water. The monitoring procedures need to be followed correctly. However, the public should not conclude this is an indication of contamination and they should know that a very well-governed drinking water supply with impeccable drinking water quality can find itself in violation of these procedures due to their complexity.

? <!--[if !supportLists]--><!--[endif]-->An exceedance of the 15 parts per billion of lead action level in any one tap sample is not an indication of the level of lead in the public's drinking water. The higher tested lead levels can often be directly caused by the particular home's plumbing where the water was sampled (a high test can result from a specific faucet design). Also, the tested level may only be a temporary result which can fluctuate greatly throughout the day and from faucet to faucet. The federal testing protocol is not designed to detect the level of lead in the public's water; it is designed to assess the efficacy of the treatment that is making the water non-corrosive.

? <!--[if !supportLists]--><!--[endif]-->**Small and rural community water utility personnel have to comply with federal operator certification requirements equally as stringently as large cities (differences in levels of certification are primarily based on treatment techniques). If there are discrete examples of regulators that have chosen to "give up" on enforcement on certain small communities, there are certainly examples of primacy agencies that have done the same for large cities, and further examples of regulators who have chosen to enforce regulations beyond what is reasonable in large and small communities. Isolated cases are not indicative of the national drinking water system that delivers some of the safest water anywhere in the world.**

? <!--[if !supportLists]--><!--[endif]-->**More regulation is not the answer to ensure the safety of drinking water supply in rural American communities. Some violations are found in communities with economically disadvantaged populations and where they are acting in good faith to provide public drinking water and comply with the federal rules. Nobody thinks it would be good public health policy to fine these citizens as a penalty for lacking technical and financial capability. This is why regulators often fail to enforce the rules with fines (they know help and education are the solution and a fine would only harm a struggling community). The current federal regulatory construct for drinking water safety is not the appropriate policy for a problem that results from lack of resources and not malfeasance. Decisions need to be made by the people who are drinking the water and paying for its treatment and delivery, and they need to accept the** responsibility. If local citizens won't take responsibility for protecting themselves, you will get more confusion, lack of accountability, and an ever-increasing bureaucracy.

? <!--[if !supportLists]--><!--[endif]-->The City of Flint drinking water crisis and the examples highlighted by USA Today should serve as a wake-up call for the public to support and participate in their local government and accept responsibility for its operation.

? <!--[if !supportLists]--><!--[endif]-->The small community paradox in federal water policy is that while we supply water to a minority of the country's population, small and rural communities often have more difficulty providing safe, affordable drinking water and sanitation due to limited economies of scale and lack of technical expertise. Also, while we have fewer resources, we are regulated in the exact same manner as a large community and our water service is often a much higher cost per household. In 2016, there are rural communities in the country that still do not have access to safe drinking water or sanitation due to the lack of population density or funding. More regulation will not bring drinking water to these communities.

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From: NRWA's Rural Water Wire [wire=nrwa.org@mail243.atl61.mcsv.net]
on behalf of NRWA's Rural Water Wire [wire@nrwa.org]
Sent: 12/15/2016 4:09:34 PM
To: Grevatt, Peter [Grevatt.Peter@epa.gov]
Subject: NRWA's Rural Water Wire news for 12/15/2016

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Vermont Rural Water Spends a Decade Bringing System into Long-Term Sustainability

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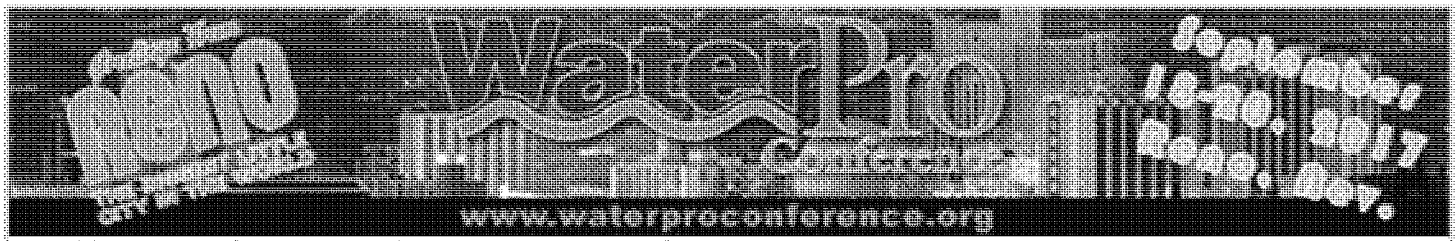

Attend the WaterPro Conference, Sept. 18-20 in Reno, Nev. www.waterproconference.org

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$10B Water Resources Bill Passes

Dec 14, 2016 03:40 pm

The Water Infrastructure Improvements Act for the Nation (WIIN) Act, formerly known as WRDA, passed the House earlier last week 360-61 and then the Senate at 1am Saturday morning by a vote of 78-21. The bill now heads to the President's desk for his signature. This legislation authorizes nearly $10 billion in federal investment. Below is a list of provisions included that are beneficial to Rural Water:

WIIN Act Provisions

- Includes new public notice requirements for exceedances of the lead action level and for distribution of independently conducted lead tap samples results
- Includes a provision intended to limit competition between the new Water Infrastructure Finance and Innovation (WIFIA) program and the SRFs
- Provides new assistance ($60 million annually for 5 years) for small and disadvantaged communities to meet Clean Water Act and Safe Drinking Water Act mandates
- Provides new funding ($10 million annually for 5 years) to advance water infrastructure research and the use of innovative water technologies
- Provides critical resources ($60 million annually for 5 years) to replace lead drinking water infrastructure in communities and schools
- Provides critical funding ($100 million) for drinking water infrastructure emergencies identified by the President
- Includes a provision to allow tribal organizations' interests to borrow the rural water EPA technical assistance provision that requires EPA to fund the technical assistance that the Indian tribes *"find to be the most beneficial and effective"* This should be helpful for the return of rural water EPA technical assistance if the tribal organizations are successful in having funds appropriated specially for this new authorization.

Provisions in the original Senate passed WRDA bill in September that were dropped during final negotiations:

- Clean Water Act Technical Assistance authorization modeled on the existing Safe Drinking Water Act authorization
- A provision fixing the Clean Water State Revolving Fund to allow technical assistance to be funded by the states administering the revolving funds
- Modifications to federal policy for determining household ability to pay for water rate increases.
- A one-time $20 million in grants for small and disadvantaged communities

This compromise legislation, which was years in the making, is a victory for Rural Water and provides opportunity for small and rural communities to meet the requirements of federal mandates.

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Sent: 11/14/2017 6:55:54 PM
To: Drinkard, Andrea [Drinkard.Andrea@epa.gov]; Grevatt, Peter [Grevatt.Peter@epa.gov]
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Subject: Re: Environmental Stakeholders Meeting with the U.S. Environmental Protection Agency's Office of Water (11.15.17)
Attachments: Top Ten Myths 9-25-17 F-1.pdf; Yanna Lambrinidou Dissent - NDWAC LCR WG Report 2015.pdf

Dear Ms. Drinkard & Mr. Grevatt:

I was just forwarded the notification of the US EPA OW Environmental Stakeholder Meeting Agenda scheduled for tomorrow, November 15, from Noon to 1:00 pm ET. I used to be the National Water Policy Coordinator for Clean Water Action and would come regularly to these meetings. Now I work with the Campaign for Lead Free Water, a coalition of frontline community groups and ENGOs such as EarthJustice and Food & Water Watch, Women for a Healthy Environment (Pitt., PA) and many community based environmental justice groups such as WaterYouFightingFor (Flint, MI) Flint Rising, (Flint, MI) and Freshwater for Life Action Coalition (MKE, WI) etc....

We would like you to know that we are interested in the national ENGO conversation with OW/OGWDW about the LCR revisions and its current implementation and enforcement. We do not think that the DC based ENGO Green Groups speak with one voice or necessarily speak for frontline communities on this issue. We think we have standing to be invited to these ongoing meetings and would like to be put on your notification list for subsequent meetings.

Also, since we got last minute notification of this meeting, I would like to request that you/OW put the LCR agenda item at the top of your agenda. This will allow me and perhaps a few other of my colleagues across the country to participate by phone.

As I am quite sure you do not know of our work, I should let you know in the spirit of full transparency, that my colleague Dr. Yanna Lambrinidou had a seat at the table for the NDWAC Work Group on the Long-term Revisions to the Lead & Copper Rule that took place in 2014/2015. She filed a dissent to the recommendations made by the utility dominated work group (see attachment). I was her official alternate to the work group. From 2004 through 2015 both Yanna and I testified numerous times in various stakeholder and other official EPA meetings regarding the short term LCR revisions and met with OW and OGWDW officials regarding the implementation and enforcement of the current weak LCR. Along with Jennifer Chavez of EarthJustice, we also met several times with both then OW Deputy Director, Joel Beauvais and with OGWDW's Peter Grevatt on these topics.

Since 2015 when Flint broke into the international and domestic spotlight we have been working in coalition with frontline communities to protect our families and communities from the pervasive lead at the tap exposure going on across the United States. Just recently, the Campaign for Lead Free Water, put up a public web site: https://www.campaignforleadfreewater.org/ and Dr. Lambrinidou published a trenchant and hard hitting article entitled *"The Top 10 Myths"* (see attachment). This well cited article is getting wide circulation, and is aimed at piercing the veil of misinformation and manufactured ignorance that has been perpetuated by CDC, HUD, HHS, OW & OGWDW over the past many administrations, who are aided and abetted by the water industrial complex (e.g. AWWA, AMWA, ASDWA, NAWC, RCAP etc...), some ENGOs, most state drinking water primacy agencies, most local health departments, many local, state and federal politicians, many in the academic and science community, many in the healthy homes and schools network, some national and regional foundations, many in the media etc...

We are demanding a seat at the table tomorrow, and recognition that frontline communities have been systematically excluded from this table and from other tables regarding the upcoming revisions to the Lead & Copper Rule. This is a basic injustice and will lead to the continuation of sub-optimal outcomes to the aforementioned rule when it is eventually promulgated and then implemented. We want inclusion, not exclusion and we do not think that the DC based national ENG community, which does not speak with one voice on the LCR and lead at the tap exposure, necessarily speaks for us. We want to be our own eyes and ears, tell our own narratives and have a seat at the adult tables where policy is being debated, not being shunted off to the side by many in the ENGO and governmental, water industrial complex stakeholder group that often belittles, silences and erases us, ignoring what we have to teach them/you from our lived experiences.

Also, we demand to be noticed and included in all NDWAC meeting notifications. Further, we demand that US EPA's heads of OW and OGWDW to do a listening tour of our communities to consult with us about our expertise with how broken the SDWA is as a law and set of regulations and guidances. We want you to hear about the health harm this lead exposure is causing to us, our families and our communities. We want you to hear about the short term and long term solutions that need to become reflected in both policy and practice at US EPA, your "co-regulators" in the states and by the water utility community and local health departments.

Thank you for your attention to this communication. We expect a response in writing.

Regards,

Paul Schwartz
Campaign for Lead Free Water
Washington, DC
(202) 279-0438

Top 10 Myths About Lead in Drinking Water

Yanna Lambrinidou, PhD

It is an honor to be invited to write about lead in drinking water for *LEAD Action NEWS*, with lead poisoning prevention advocates Maria and Wayne Askew as guest editors. Although my knowledge about the subject is limited to the United States (US), I sincerely hope that at least some parts of this piece are useful to readers internationally.

The 10 myths below are preceded by a reflection on the social and political context of their creation and perpetuation. Out of concern that the existence of myths about a contaminant as hazardous as lead in drinking water can have serious public health and policy implications, and can exacerbate the environmental injustice that is already committed against communities across the US, I felt compelled to offer some thoughts on where the myths come from, and what role communities have played – and must continue to play – to correct them. This reflection is informed by my personal experience with Washington, DC's historic lead-in-water crisis of 2001-2004; my work on the crisis' aftermath since 2007; and my more recent collaboration through the Campaign for Lead Free Water with frontline communities in cities like Flint, Michigan; Milwaukee, Wisconsin; and Pittsburgh, Pennsylvania, working to address lead-in-water contamination problems of their own.

Although I hope that the context I provide can support and advance our work on the ground as well as perhaps the work on the ground of communities across the globe, this context is not necessary for making sense of the myths that follow. So, please, feel free to read it but also feel free to scroll directly to the 10 myths, below my reflection!

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Reflection

In my ten years of work on lead in drinking water in the US, I have come to the conclusion that the problem is as much one of lead-bearing plumbing as it is of structurally manufactured ignorance. What I am referring to by this jargonistic term is officially sanctioned silence as well as dissemination of inaccurate, incomplete, or misleading information about the issue that the very institutions with the responsibility, authority, and power to protect us, systematically employ. The result is a public that, by and large, lacks the knowledge required not only to prevent exposures to lead in drinking water but also to recognize the existence, prevalence, and severity of the problem; appreciate its associated health risks; take action to correct it; and hold those responsible for it accountable.

The institutions manufacturing our ignorance include:

a. Regulated public water utilities and the drinking water industry at large;
b. Regulating government agencies, policymakers, and elected officials at the federal, state, and local government levels;
c. School officials; and
d. The medical, public health, and environmental health communities, including influential non-governmental organizations.

It is important to note that all these institutions speak as, and through, officially sanctioned experts; claim as their mission to protect the public's health; and all, at least in theory, are dedicated to the prevention of childhood lead poisoning.

Three additional entities that often play a facilitating role in the cultivation of our ignorance are:

a. Academic institutions and professional organizations, whose members tend to limit their participation in the matter to the production of specialized knowledge, shared primarily with groups other than affected publics (e.g., other academics, public water utilities and the drinking water industry, governmental institutions, and foundations);
b. Funding bodies that refuse to sponsor projects on lead in water or sponsor projects led by groups with an established record of downplaying or obfuscating the problem; and
c. The press, which frequently fails to carry out substantive or sustained reporting on the issue, or delivers official declarations uncritically and unquestioningly, even when these declarations are fundamentally incorrect.

It goes without saying that individuals within all of the above categories have at times taken decisive action to ensure that scientifically, historically, and legally accurate information is produced, publicly released, or adopted in policy recommendations or local interventions. In fact, the work and progress of affected communities so far would have been practically impossible without the contributions of dedicated government employees, drinking water quality experts, professionals in non-governmental organizations, and reporters willing to challenge the very foundations of the ignorance produced. Sadly, however, this informed resistance has had limited impact on how the institutions with the responsibility, authority, and power to protect us understand, respond to, and present the problem of lead in drinking water. More importantly, it has had limited impact on our ability to protect ourselves, as well as our fetuses, infants, and children from preventable, and yet irreparable, harm from lead at the tap.

In *Agnotology: The Making & Unmaking of Ignorance* historian of science Robert N. Proctor asserts that the production of collective ignorance can be conscious and unconscious, intentional and unintentional. Collective ignorance can be created and perpetuated by many different groups, formally organized and not. Its drivers can include multiple conditions – for example, "neglect, forgetfulness, myopia, extinction, secrecy, or suppression" (2008:3). Collective ignorance can feel "natural" both to those who promote it and to those who are subjected to it. It can cultivate in us a comfortable and comforting blindness. Perhaps most concerning is that collective ignorance can shape our understanding of matters that have significant effects on us – what historian and philosopher of science Kevin C. Elliot (2012) characterizes as "socially important." Socially important ignorance can disempower us to act in our own best interests and can create the preconditions for exploitation, injustice, and harm.

A close examination of the recent history of lead in US drinking water reveals a recurring tension between, on the one hand, officially sanctioned narratives about the problem and, on the other, narratives of communities directly impacted by the problem. Community narratives are often generated in response to resident discoveries of lead-laced tap water or elevated blood lead levels from ingestion of such water. They are refusals to accept as "normal" experiences and observations that feel abnormal. They are at once articulations of distress and repositories of information that deviates from dominant understandings of reality. They are vehicles for protest where there was harmony, resistance where there was obedience, doubt where there was trust, and discomfort where there was comfort. They are demands for a "fix" that looks, feels, and measures like a fix. They are expressions of refusal to take for granted the "taken for granted," even if the "taken for granted" is promoted and imposed by "the experts."

Community narratives tend to question, complicate, expand, or oppose officially sanctioned narratives. Sometimes they go even further to challenge the trustworthiness of the creators and disseminators of officially sanctioned narratives. When this happens, community narratives signal decreasing willingness on the part of the public to accept the role of "non-knower" and to continue substituting its own judgments with the judgments of officially sanctioned experts (Hufford 1996). As a result, community narratives can pose a threat to the very authority of institutions that establish the dominant epistemic order (meaning, *who* can make knowledge and *how* knowledge ought to be made in order to be accepted as "valid"). Therefore, community narratives can pose a threat to the dominant social order as well. This is because institutional authority – and, by extension, status and power – necessitate the general public's embrace of the idea that institutions hold superior knowledge, possess superior methods for developing this knowledge, and employ superior judgment for applying this knowledge to promote the public good.

Perhaps not surprisingly, community narratives tend to receive attenuated, if any, institutional credibility. The persistent and systematic rejection of information that a) comes from groups whose members our society deems to be "non-knowers," and b) has the potential to change officially sanctioned paradigms of thought and practice, is a phenomenon that philosopher Miranda Fricker calls "testimonial injustice." According to Fricker, this is "the injustice that a speaker suffers in receiving deflated credibility from the hearer owing to identity prejudice on the hearer's part" (2007:Kindle Locations 100-101). Fricker characterizes testimonial injustice as an "epistemic disadvantage" to the hearer – "a moment of dysfunction in the overall epistemic practice or system." Furthermore, she explains, "That testimonial injustice damages the epistemic system is directly relevant to social epistemologies [...] for prejudice presents an obstacle to truth, either directly by causing the hearer to miss out on a particular truth, or indirectly by creating blockages in the circulation of critical ideas. Further, the fact that prejudice can prevent speakers from successfully putting knowledge into the public domain reveals testimonial injustice as a serious form of unfreedom in our collective speech situation – and [...] the freedom of our speech situation is fundamental to the authority of the polity, even to the authority of reason itself" (2007:Kindle Locations 596-601).

The history of lead in US drinking water is marked by a long and still-growing chain of testimonial injustices committed against community groups in Washington, DC; Flint, MI; Milwaukee, WI; Pittsburgh, PA; and other cities in the country. These groups have, at one time or another, all challenged different components of the manufactured ignorance about the problem because they have refused to accept these components as "natural" (e.g., Carmody 2017, Bence 2017, Deprey 2017, Earthjustice 2017; Naccarati-Chapkis 2017, Milman 2016, Earthjustice et al. 2015, Lambrinidou 2015, Lambrinidou, Triantafyllidou, & Edwards 2010, Mitchell & Brion 2010, Alliance for Healthy Homes et al. 2008, Birnbaum 2008, Leonnig 2007, Holder 2004). In turn, they have often been discredited, silenced, or responded to in ways that seem to have done more to contain their politically disruptive potential than address their concerns.

What is especially important about the dynamic interplay of a) the structural cultivation of ignorance and b) the silencing of those who react against this ignorance is that it perpetuates and bolsters socially important beliefs about lead in US drinking water. These beliefs or myths have come to shape our society's understanding of the problem and to form the cornerstone of related public policies, public messaging, public health decisions, medical practices, and drinking water use behaviors. I submit that as a result they have left, and continue to leave, generations of unsuspecting populations disempowered and needlessly at risk of irreversible harm from lead at the tap.

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The Myths

The list of myths below is not exhaustive. It features only some of the most prevalent claims officially sanctioned experts in the US make about lead in drinking water.

Myth 1: Tap water that tests below 15 parts per billion (ppb) lead is safe for drinking and cooking.

Fifteen ppb lead is a technical threshold that was developed and adopted to act as a trigger for water utility compliance with regulatory requirements (Pupovac 2016). It was not meant as a health-based standard. In infants, for example, lead-in-water levels below 15 ppb have been predicted to raise blood lead levels in at least a small percentage of the exposed population (Triantafyllidou, Gallagher, & Edwards 2014). For lead in drinking water, the health-based goal set by the US Environmental Protection Agency (EPA) is zero ppb (EPA 2017), and the recommended health-protective standard set by the American Academy of Pediatrics (AAP) for lead in water in schools is 1 ppb (AAP 2016).

It is also important to note that lead levels in drinking water tend to fluctuate. Any lead-bearing plumbing component can release dramatically different concentrations of lead at different times and under different conditions. According to a recent study, "To adequately characterize whether water in a given home with lead plumbing is truly safe, a very high number of samples would have to be collected under a range of flow conditions" (Masters et al. 2016:13). Standard lead-in-water testing, however, involves one or, at most, two samples from a tap, and routinely misses worst-case lead levels. It is, therefore, possible that a drinking water outlet measuring below 15 ppb one time will dispense lead in the hundreds and thousands ppb at other times (Triantafyllidou & Edwards 2012).

For these two reasons – the toxicity of even low levels of lead in water and the fact that our testing methods are not designed to capture worst-case lead in drinking water – a tap measurement below 15 ppb does not signify that the water is safe for drinking or cooking. Yet the 15 ppb myth is perpetuated even by leading public health institutions like the US Centers for Disease Control and Prevention (CDC).

Myth 2: Tap water that meets federal lead-in-water requirements is safe for drinking and cooking.

In the US, federal lead-in-water requirements are embodied in the EPA regulation called the Lead and Copper Rule. For a city's tap water to meet Lead and Copper Rule requirements, water utilities must take *one sample* from *one tap* at a small number of "high-risk" homes known to have either a lead service line (i.e., the pipe that connects a house to the water main under the street) or other lead-bearing plumbing prone to leach lead. For many major metropolitan utilities, for example, the minimum number of tap samples required from the entire system is as low as 50. If 90% or more of the samples collected measure below 15 ppb, the utility is deemed "in compliance" with the Lead and Copper Rule. Lead and Copper Rule compliance allows for up to 10% of taps to dispense any concentration of lead whatsoever. For example, in the latest Lead and Copper Rule test results it made public (July-Dec 2015), the Washington DC water utility took one sample from one tap at 110 homes and achieved regulatory compliance with the following results: 59 homes measured at 0 ppb; 50 homes measured between 1-8 ppb; and 1 home measured at 1,269 ppb. In other words, even when water utilities comply with the Lead and Copper Rule, the consumers they serve can experience both chronic and acute exposures to lead, without triggering a regulatory violation. Despite this fact, the EPA allows water utilities to declare their water "safe" for drinking and cooking, simply because they meet regulatory requirements (Q&A session, EPA Lead and Copper Rule stakeholder workshop, Washington DC, October 14-15, 2008).

Myth 3: Lead in drinking water is a "legacy" problem affecting only homes built before 1986.

In 1986, US Congress passed a law called the "Lead Ban," which made illegal the use of pipes and pipe fittings containing more than 8% lead by weight. The Lead Ban also made illegal solder and flux containing more than 0.2% lead by weight. Plumbing materials meeting the Lead Ban's new requirements were labeled under the law as "lead free." Almost 30 years later, in 2014, Congress implemented a stricter definition of "lead free" by reducing the 8% lead-by-weight cap for pipes and pipe fittings to "a weighted average of 0.25% lead calculated across the wetted surfaces of a pipe, pipe fitting, plumbing fitting, and fixture" (EPA 2017). However, as the non-profit environmental law organization Earthjustice has pointed out, "The amount of lead tolerated under this definition depends on how the 'weighted average' is calculated. [...] This averaging approach allows small components with significant amounts of lead to be cancelled out by other parts of a fixture or pipe that contribute a greater portion of the surface area" (Earthjustice et al. 2017).

Today:

- An estimated 6.5-10 million US homes have a lead service line containing 100% lead by weight (EPA 2016) (according to Triantafyllidou & Edwards 2012, lead service lines and lead pipes inside homes are even more prevalent in countries like France, the United Kingdom, Germany, and Portugal);
- An estimated 81 million US homes have lead solder containing 40-50% lead by weight (Triantafyllidou & Edwards 2012);
- US homes built between 1986-2013 have plumbing components containing up to 8% lead by weight; and
- US homes built since 2014 have plumbing components containing a weighted average of 0.25% lead calculated across their wetted surfaces.

Although homes built before 1986, especially those with lead service lines, are at very high risk for lead in drinking water, homes built after 1986 can also experience significant contamination (Triantafyllidou & Edwards 2012). In fact, recent evidence shows that in buildings with plumbing that meets the 2014 definition of "lead free," taps can still dispense high levels of lead. Specifically, in 2016, testing at Flint, Michigan schools following removal of old plumbing and installation of new "lead free" fixtures showed lead-in-water concentrations that reached as high as 415 ppb.

Myth 4: All one needs to do to find out if there is lead in their tap water is to have their tap water tested.

Lead in drinking water appears in two forms: *soluble lead* (e.g., like salt or sugar dissolved in water) and *lead particles* (i.e., detached small pieces of lead-bearing rust, brass, solder, or pipes). Some lead particles can be large enough to be visible by the naked eye. Unlike soluble lead, lead particles can contain extraordinarily high concentrations of lead, reaching into the tens and hundreds of thousands ppb (water with lead levels over 5,000 ppb classifies as "hazardous waste") (Triantafyllidou & Edwards 2012). Assessing lead-in-water problems where lead particles are present poses a serious challenge. Because lead particles tend to release erratically and unpredictably, "catching" them through standard sampling methods is often likened to a game of Russian roulette. In other words, lead particles can be – and are – easily missed. Moreover, because they can contain widely ranging concentrations of lead (their lead content can span from 3% to 100%), accurate determination of average lead levels from a single tap can require collection of hundreds and, in extreme cases, over 1,000 repeated samples (Masters et al., Power Point presentation, International Symposium on Inorganics, *American Water Works Association*, March 21-22, 2017). Yet standard testing for lead in drinking water involves one or, at most, two samples from a single tap. As a result, it routinely misses worst-case lead levels and often results in assumptions of "safety," even when significant lead-in-water problems exist (Masters et al. 2016). It is worth noting that, according to a water utility industry funded study, if the sampling protocol used for Lead and Copper Rule compliance purposes were designed to capture worst-case lead from lead service lines, an estimated 70.5% of water utilities with such lines would exceed the Lead and Copper Rule's 15 ppb threshold and would be legally required to take urgent remedial action (Slabaugh et al. 2015; Slabaugh, Power Point presentation, Water Quality Technology Conference, *American Water Works Association*, November 16-20, 2014).

Myth 5: For a child to get lead poisoning from tap water, they would need to drink an inordinate amount of this water every day.

Given that lead in drinking water can appear in the form of particles, and that such particles can contain extraordinarily high concentrations of lead, elevations of blood lead levels above (and far above) 5 and 10 micrograms per deciliter can occur, and have been extensively documented, in children who ingest ordinary amounts of lead-tainted water or eat ordinary amounts of food cooked with such water (Triantafyllidou, Parks, & Edwards 2007). In fact, when particles contain high enough levels of lead, children are predicted to experience acute blood lead level spiking even from a single 250 milliliter drink of water or a single portion of food cooked with 750 milliliters of water (Triantafyllidou, Gallagher, & Edwards 2014; Lambrinidou, Triantafyllidou, & Edwards 2010). In fact, exposure to lead particles with concentrations like those detected in 2011 in "City B" (580 ppb); in 2015 in Flint, Michigan (>5,000 ppb); and in 2015 in Washington DC (1,269 ppb) – all during periods of regulatory compliance with the Lead and Copper

Rule – can expose pregnant women to a daily lead dose exceeding that in the lead abortion pills of the 1900s (Edwards 2014).

Myth 6: Unlike Flint, Michigan, most cities do treat their water with corrosion control so they are protected against lead-in-water contamination.

Corrosion control treatment aims at reducing the water's ability to "eat away" at lead-bearing plumbing and cause contamination. Indeed, lead-in-water levels across the US have dropped markedly since the early 1990s due to the Lead and Copper Rule requirement that all large water utilities treat their water to reduce its corrosivity. Corrosion control treatment, however, has three significant limitations:

- It can reduce, but not entirely prevent, lead release into drinking water (e.g., Wasserstrom et al. 2017);
- It is markedly more successful at reducing soluble lead than lead particles. As a result, the "majority of lead in many distribution systems is now in a particulate form" (Masters et al. 2016:2); and
- It cannot eliminate conditions unrelated to the water's corrosivity that encourage the release of lead from plumbing (e.g., age of plumbing; prolonged periods of stagnation due to lack of water use; routine low water use; hot water use; use of high water flow; increase in outside temperature; and physical disturbance of plumbing due to, for example, street work, renovations, or heavy traffic) (Lytle & Schock 2000; Del Toral, Porter, & Schock 2013; Masters et al. 2016). These conditions can dislodge small pieces of lead-bearing rust, brass, solder, or pipe, which can in turn pose an immediate and acute health risk to consumers analogous to lead paint (Lambrinidou 2015).

According to Triantafyllidou and Edwards, " The drinking water industry presently lacks the tools or knowledge to completely prevent or control particulate lead release" (2012:1318). Precisely because corrosion control treatment cannot, by itself, address the problem of lead in drinking water, water utility compliance with the Lead and Copper Rule allows for all monitored taps to dispense up to 15 ppb lead and up to 10% of monitored taps to dispense any concentration of lead whatsoever. Despite this allowance, water utilities can still fail to meet the Lead and Copper Rule's 15 ppb threshold (e.g., Providence, Rhode Island; Jackson, Mississippi) (NRDC 2016).

Myth 7: Lead in drinking water can pose a problem only when the water has been sitting in lead-bearing plumbing for a long time. A quick flush before use will get rid of any contamination.

Prolonged stagnation of water in lead-bearing plumbing has, indeed, been shown to increase lead leaching (Lytle & Schock 2000). But there are conditions other than stagnation that can encourage corrosion of lead-bearing plumbing (e.g., intentional and unintentional changes in water chemistry; age of plumbing; hot water use; use of high water flow; increase in outside temperature; and physical disturbance of plumbing due to, for example, street work, renovations, or heavy traffic) (Edwards & Triantafyllidou 2007; Del Toral, Porter, & Schock 2013; Masters et al. 2016). Although flushing can, under certain circumstances, temporarily eliminate or partly reduce lead-in-water contamination, it cannot be relied upon to prevent exposures. First, if the home has a lead service line and the flush is not long enough, flushing prior to use can actually elevate the risk of exposure by bringing to the faucet the water that had prolonged contact with the lead service line (Del Toral, Porter, & Schock 2013). Second, because lead leaching, especially of lead particles, tends to occur unpredictably, flushing prior to use cannot guarantee that when the flush ends the water collected will be free of lead. In their discussion about the variability of lead release, Masters at al. (2016) assert that: "To adequately characterize whether water in a given home with lead plumbing is truly safe, a very high number of samples would have to be collected under a range of flow conditions. In some cases, it is desirable to characterize this risk in a given system, and in other cases, it would simply be more cost-effective to acknowledge that as long as lead-bearing plumbing is present, there is a significant risk of health hazards from semi-random concentrations of lead in water samples. *These hazards can be partly reduced by flushing, but can be eliminated by installation of lead filters or removal of lead plumbing*" (emphasis added).

Myth 8: Lead in drinking water is a problem of privately owned lead-bearing plumbing.

One of the most hazardous plumbing materials in existence is lead service lines, which are made of 100% pure lead and in some jurisdictions – like Chicago, Illinois and Milwaukee, Wisconsin – were mandated by law (Hawthorne & Matuszak 2016; Spicuzza 2016). In the majority of US jurisdictions, the utility owns the portion of a service line that lies between the water main and the property line, curb stop, or water meter (AWWA 2014). Legal ownership of the portion of a service line that lies between the property line, curb stop, or water meter and the home (i.e., in privately owned property) is often more difficult to determine but, in most cases, utilities or municipalities have control over the material composition and maintenance of this portion as well (1991 Lead and Copper Rule, 56 Fed. Reg. at 26504; Earthjustice 2014). Even when a home does not have a lead service line, however, attributing lead-in-water contamination to privately owned plumbing is misleading, for it implies that sole responsibility for the problem lies with homeowners. In reality, lead corrosion of plumbing materials is inextricably linked to drinking water corrosivity, and drinking water corrosivity is to a great degree – albeit not completely – controlled by water utilities. This link is the foundation of the Lead and Copper Rule. Additionally, the very fact that lead is added to plumbing materials to this day without consumer knowledge or approval renders consumer "blaming" for ownership of lead-bearing plumbing difficult to justify.

Myth 9: Lead in drinking water is almost never the primary source of lead poisoning.

Historical and scientific documentation illustrates clearly that lead in drinking water can, indeed, constitute the primary source of lead poisoning (Engel 1986; Renner 2006; Troesken 2006; Triantafyllidou & Edwards 2012). Moreover, the CDC estimates that 30% or more of elevated blood lead level cases in the US do not have an immediate lead paint source (Levin et al. 2008). But when children are diagnosed with elevated blood lead levels, environmental risk assessments at their homes are not designed to find lead at the tap. CDC's case management guidelines recommend a focus on "immediate lead hazards," pointing to deteriorating lead paint, dust, and soil (CDC 2009:23). The same guidelines insinuate that federal regulations to minimize lead in water (e.g., the Lead Ban, the Lead and Copper Rule) offer adequate public health protection. On the basis of this assumption, they suggest that environmental risk assessments at the homes of children with elevated blood lead levels forgo lead-in-water sampling unless:

- The tap water of the city where the children live exceeds the Lead and Copper Rule's 15 ppb threshold; or
- No non-water sources of lead can be found in the children's homes; or
- The water used for drinking and cooking in these homes comes from a well (well water is not regulated under the Lead and Copper Rule).

The same guidelines encourage any lead paint, dust, and soil identified in the children's environments to be marked as the primary source of exposure, even if in reality the primary source is the drinking water. Moreover, when drinking water is actually tested, sampling techniques rarely – if ever – involve the extensive sampling required to capture erratically releasing lead particles. As a result, lead at the tap is routinely missed as the primary cause or a contributor to children's elevated blood lead levels (Scott 2009; Renner 2009; Triantafyllidou & Edwards 2012).

Myth 10: The fact that blood lead monitoring data show dramatic declines in children's blood lead levels over the years suggests that lead in drinking water does not pose a significant public health risk.

The preamble to the Lead and Copper Rule of 1991 states that, "...the total drinking water contribution to overall lead levels may range from as little as 5 percent to more than 50 percent of children's total lead exposure. Infants dependent on formula may receive more than 85 percent of their lead from drinking water. As exposures decline to sources of lead other than drinking water, such as gasoline and soldered food cans, drinking water will account for a larger proportion of total intake" (1991 Lead and Copper Rule, 56 Fed. Reg. at 26470). To date, however, the US blood lead surveillance system does not include regular monitoring of fetuses', infants', or young children's exposure to lead-laced tap water. Even though lead in drinking water has been found a) to be a primary source of lead exposure, and b) to cause miscarriage, fetal death, and elevated blood lead levels, systematic tracking of its presence in blood simply does not occur (Hanna-Attisha et al. 2016; Edwards 2014; Triantafyllidou & Edwards 2012; Edwards, Triantafyllidou, & Best 2009; Triantafyllidou, Parks, & Edwards 2007). In fact, the blood lead surveillance system currently in place misses both chronic and acute exposures to lead in drinking water. Specifically:

- The two most vulnerable populations to lead at the tap – fetuses and infants dependent on reconstituted formula – are rarely tested for lead in blood;
- A significant percentage of young children are never tested for lead in blood, and when they are tested their results often go unreported (Roberts et al. 2017); and
- Recommended strategies for blood lead testing are not designed to capture exposures to lead at the tap. Target children are around the ages of 1 and 2, prone to putting their hands in their mouth, and living in areas with housing presumed to contain deteriorating lead paint (Schneyer & Pell 2016). Moreover, the actual test involves a one-time blood draw that is repeated only when the result is deemed "high." This approach does not account for the fact that the half-life of lead in blood is approximately one month. Unless the test occurs within a few days or weeks after exposure, blood lead elevations can be missed.

This is especially problematic for exposure to lead particles, which can contain exceedingly high concentrations of lead and cause short but acute blood lead level spikes (Triantafyllidou & Edwards 2012).

In summary, current blood lead monitoring data cannot be relied upon to draw conclusions about the public health risk of lead in US drinking water.

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Acknowledgments: I thank Jennifer Chavez, JD; Paul Schwartz; and Tom Walker, PhD for their invaluable feedback on this document. Miguel Del Toral at US EPA, Marc Edwards, PhD at Virginia Tech, and Michael Schock at US EPA have been instrumental in teaching me about the science of lead corrosion and the workings of the Lead and Copper Rule. All opinions and any errors are my own.

•••

Yanna Lambrinidou, PhD, is affiliate faculty at the Department of Science and Technology in Society at Virginia Tech, President of Parents for Nontoxic Alternatives, and founding member of the Campaign for Lead Free Water. She can be reached at yanna@vt.edu.

Message

From: Grevatt, Peter [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D3CAA0C39EBE44CB9D3AE44DA7543733-GREVATT, PETER]
Sent: 10/15/2016 10:53:27 AM
To: Tracy Mehan [tmehan@awwa.org]
Subject: Tier I Sample Site Selection and Approval for Reduced Monitoring Schedules Under the LCR
Attachments: LCRMemo_10.13.16.pdf

Hi Tracy. Please see attached the memo I mentioned in my voicemail on LCR sampling sites and reduced monitoring schedules.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 13 2016

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of the Lead and Copper Rule Provisions Related to Sample Site Selection and Triennial Monitoring

FROM: Peter C. Grevatt, Director
Office of Ground Water & Drinking Water

TO: Water Division Directors
Regions I-X

As part of EPA's on-going oversight responsibilities, the Office of Ground Water and Drinking Water (OGWDW) has worked with the Regions to conduct a thorough review of implementation of the Lead and Copper Rule (LCR). One area that requires additional attention relates to compliance sampling site selection and the use of tier 1 sites by community water systems (CWSs). I ask that you and your primacy agencies ensure that implementation of the LCR is consistent with the rule requirements discussed below and that this information is well-documented. I also request that you and your primacy agencies pay close attention to the documentation the agency will expect to have available during program reviews regarding future primacy agency decisions to approve requests from public water systems seeking to return to triennial monitoring[1] after a lead action level exceedance.

Tier 1 Sample Site Selection

Under the current LCR, the CWSs are required to identify and use tier 1 sites for their compliance monitoring under 40 CFR §141.86. When a system no longer has enough tier 1 sites in its sample pool to meet the minimum number of samples (e.g., due to plumbing changes or lack of homeowner participation), the system must identify other tier 1 sites to add to its sample pool.

[1] Systems serving more than 50,000 persons and small and medium systems with state-defined optimal water quality parameters must receive written approval from the primacy agency to return to reduced monitoring after a lead action level exceedance. 40 CFR § 141.(86)(d)(4)(vi)(B).

Tier 1 sampling sites are defined in the LCR as "single family structures[2]" that contain "copper pipes with lead solder installed after 1982 or contain lead pipes; and/or served by a lead service line."[3] As required under 40 CFR §141.86(a), all sites used for lead and copper compliance tap sampling must be tier 1 sites unless there are "insufficient tier 1 sampling sites." The phrase "insufficient tier 1 sampling sites" refers to sites in the distribution system. It does not refer to the sites currently in the sample pool.

Under the LCR, CWSs are required to identify a pool of targeted sampling sites that is sufficiently large to ensure the water system can collect the number of samples required in §141.86(c). The regulations at 40 CFR §141.86(a) (1) and §141.42(d) in Subpart E of Part 141, require water systems to develop a materials evaluation to identify the requisite number of tier 1 sites. The regulations at 141.86(a)(2) also state that the system is required to take additional measures "in order to identify a sufficient number of sampling sites" if the materials evaluation is insufficient. Specifically, the regulations state "… the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities): (i) All plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system; (ii) All inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and (iii) All existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations."

In some cases, materials evaluations may not have been sufficiently robust to meet the targeted sampling site requirements of the rule or they may need to be updated. To ensure that a public water system is able to accurately identify the presence of tier 1 sites, the public water system should periodically update its materials evaluation to capture any recent changes to the available sites for sampling. For example, such updates would be opportune when distribution system maintenance projects occur. Several states have informed us that they are already requiring their public water systems to update their materials evaluations. EPA strongly recommends that public water systems maintain and submit upon request to their primacy agency documentation to confirm that the system periodically updates its materials evaluation including a description of the sources used to update this information.

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[2] Where multi-family structures make up more than 20 percent of the structures served by the system, those types of structures may be used instead of single family structures.

[3] Congress enacted the Safe Drinking Water Act Amendments of 1986 that included a prohibition on the use of pipe, solder, or flux that are not lead free in potable applications, including public water systems . Existing EPA guidance clarifies that tier 1 sites for solder generally should have ages between 1982 and the effective date of the lead ban in States (42 U.S.C. 300g-6). *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems, page 25: Document # EPA 816-R-10-004, March 2010*

Eligibility for Triennial Tap Monitoring for Lead after an Action Level Exceedance

Any water system approved for reduced tap monitoring must return to standard monitoring if it exceeds the action level according to 40 CFR §141.86(d)(4)(vi). To return to triennial monitoring, public water systems will need to complete two rounds of 6-month sampling and two years of annual monitoring with 90th percentile results below the action level.[4] For systems serving more than 50,000 persons and small and medium systems with state-defined optimal water quality parameters, the primacy agency must provide written approval for a system to return to reduced monitoring per 40 CFR §141.86(d)(4)(vi)(B).

EPA Regions should act in their oversight capacity, to clearly communicate the expectation that primacy agencies will critically consider relevant aspects of a water system's LCR program including corrosion control treatment and historical performance before granting triennial monitoring. In addition, where the primacy agency finds that a public water system is lacking in technical, managerial, and financial capacity, the primacy agency could decide to keep the system on an annual LCR monitoring schedule. Regions should communicate the expectation that primacy agencies will be prepared to provide appropriate documentation of the relevant factors taken into consideration when making decisions to approve or disapprove triennial monitoring for those systems subject to primacy agency approval. Regions should also communicate the importance of primacy agencies maintaining existing documentation supporting past decisions to approve a reduced monitoring schedule for systems that are required to obtain state written approval and have previously experienced concerns with lead in drinking water, such as systems that were approved for a reduced monitoring schedule soon after they had reported an action level exceedance. In accordance with 40 CFR §142.14(d)(5), primacy agencies must retain records of their monitoring frequency decisions, including the monitoring results and other data supporting the decision, the primacy agencies' findings based on the supporting data and any additional bases for such decision. Additional primacy agency record keeping requirements specific to the LCR are located at 40 CFR §142.14(d)(8).

EPA Regions should also communicate the expectation that the primacy agency will work with the water system to ensure they are identifying and addressing the root cause(s) of action level exceedances before the system commences or returns to triennial monitoring. For those systems which require written state approval, EPA expects that primacy agencies will be prepared to provide documentation demonstrating that they have reviewed those systems prior to approving a reduced monitoring schedule, to determine whether any additional factors exist that call into question the appropriateness of reduced monitoring, and to revise a system's eligibility as necessary for ensuring public health protection.

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[4] If a system has 90th percentile lead levels of less than or equal to 0.005 mg/L and 90th percentile copper levels of less than or equal to 0.65 mg/L for two consecutive six-month monitoring periods, they may resume triennial monitoring sooner in accordance with 40 CFR 141.86(d)(iv)(A) or (B) and 40 CFR 141.86(d)(4)(v).

Conclusion

EPA Regions, primacy agencies and public water systems should work together to ensure robust implementation of the current LCR. OGWDW will continue to support the Regions in these efforts, including promoting innovative approaches to identify lead service lines and lead components in drinking water distribution systems. Please share these technical recommendations with your primacy agencies' drinking water program directors. If you have any questions, please contact Anita Thompkins at thompkins.anita@epa.gov.

Message

From: Helm, Erik [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6770EF5BB04224A198D70B5988B765-EHELM]
Sent: 6/20/2014 3:45:16 PM
To: Steve Via [SVia@awwa.org]
Subject: RE: Upcoming conference call on sampling protocols

Steve,

First, the timing, the next NDWAC working group meeting is scheduled for September 18-19th. On the draft agenda are two topics: sampling protocol, and lead and copper public education requirements. In preparation for this meeting, we are now planning on two webinars. The date for the sampling protocol webinar has been set for September 9. The presenter will be asked to participate in the September 9 meeting, which should be about three and a half hours in the afternoon from 1:00 – 4:30pm EST. In addition, the presenter will be asked to have their draft presentation ready by August 27 and participate in a one-hour prep meeting to go over the technology and dry run quickly the presentations. This prep meeting would be held based on peoples' availability in the September 3-5th window. The lead and copper public education webinar date has not been determined, but the days which are under consideration are August 18- 21th, with a possible back up of September 11th. The webinar and the preparation for presenters would follow the same format as for the protocol webinar. I one hour prep meeting would be held the week prior to the webinar (most likely August 13- 15th) and the draft presentation would be due on August 8 or 11th.

As per our formula we have developed during the past webinar and NDWAC meeting, the utility perspective on implementation issues under the current LCR would be the focus of the AWWA presenters for public education and sampling protocol. For the public education section, it would be great if you could have someone with experience discuss their experiences with the lead public education requirements they had to implement because of an action level exceedance and the consumer confidence report. What worked best? What problems they had? What seemed to be ineffective? Some information on the expense of these actions would also be great. In addition, some perspective on a constant or preemptive education campaign versus only educating after the AL exceedance would be helpful. The presenters at the ACE conference from Denver seemed to have a lot of good information.

For the sampling protocol webinar, it would be great to get utility perspective on how accurate and affective the current first draw sampling works based on field experience with homeowners. When systems or contractors have done more complicated sampling how has that worked and did they rely on the homeowners. The costs of current sampling and cost of other types of sampling. What shifting from first draw sampling might mean for utilities.
I hope that this will help. If you have questions let me know. I will be out of the office on vacation next week but I will return on Tuesday, September 1.

erik

Erik C. Helm, Ph.D.
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From: Steve Via [mailto:SVia@awwa.org]
Sent: Friday, June 20, 2014 9:35 AM
To: Helm, Erik
Subject: Upcoming conference call on sampling protocols

Eric,

Sorry for not getting back to you yesterday. If there is an opportunity to present information on sampling protocols, yes we have a couple of folks that could contribute.

If you would, let me know the schedule for the run-up to the conference call and how you all see the questions / issues being laid out so that we can get the right person and target the content appropriately.

Thanks,
Steve

Steve Via
Regulatory Affairs Manager
American Water Works Association
1300 Eye Street NW, Suite 701W
Washington, DC 20005
t. (202) 326-6130
e. svia@awwa.org

Message

From: Helm, Erik [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6770EF5BB04224A198D70B5988B765-EHELM]
Sent: 7/10/2014 2:59:17 PM
To: JONES, STACY [SJONES@idem.IN.gov]; Gail Bingham [gbingham@resolv.org]; Osterhoudt, Darrell [dosterhoudt@asdwa.org]
Subject: RE: September 18-19 LCR NDWAC working group meeting
Attachments: NDWAC LCR draft agenda Sept 18-19 2014_(7-3-14).docx

Will this work for you?

Erik C. Helm, Ph.D.
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From: JONES, STACY [mailto:SJONES@idem.IN.gov]
Sent: Thursday, July 10, 2014 9:16 AM
To: Gail Bingham; Helm, Erik; Osterhoudt, Darrell
Subject: September 18-19 LCR NDWAC working group meeting

I can't process ANY paperwork here in Indiana without an agenda (at least a rough draft of one) for the meeting (even though the state isn't paying anything except my salary while I am there).

If anyone has even a rough draft of an agenda, can you please forward it to me. They'd like paperwork in 8 weeks before the meeting and one of the people in my signature line will be out next week.

Stacy Jones
Regulatory Implementation Specialist
Drinking Water Branch
Indiana Department of Environmental Management
100 N Senate Ave (66-34)
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(317) 234-7454
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sjones@idem.IN.gov

U.S. Environmental Protection Agency
NDWAC LEAD AND COPPER WORKING GROUP

The Cadmus Group, Inc.
1555 Wilson Blvd., Suite 300 | Arlington, VA 22209
703.247.6161

September 18-19, 2014

Agenda

Meeting Objectives/Desired Outcomes:

- **Welcome new members;**
- **Approve May meeting summary;**
- **Share follow up ideas and questions concerning webinars;**
- **Provide input on what cost effective sampling protocols that achieve public health improvement might look like;**
- **Provide input on questions related to public education; and**
- **Plan next steps.**

Advance materials: LCR White Paper; Sampling and Public Education Primers

Thursday September 18th, 2014

8:45-9:00 Informal gathering

9:00-9:45 Welcome, Introductions, Meeting Objectives/Agenda, Materials and Logistics, and Approve May Meeting Summary

Advance materials: Proposed agenda, May meeting summary

Welcome: Eric Burneson, Director, Standards and Risk Management Division, Office of Groundwater and Drinking Water
Introductions: Gail Bingham, *facilitator*

9:45-10:45 Discussion: Follow up on Key Points from Webinars
Objectives: Recap topics covered by speakers on sampling protocols and public education webinars. Address any unanswered or follow up questions. Share "take-aways."

10:45-11:00 BREAK

11:00-12:15 Discussion: Sampling Protocols: Implications in Context of the Entire Rule
Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions: [Note: Gail call at least some NDWAC WG members to ask what questions they would like to address.]

- What are the pros and cons of taking a first draw sample?
- ~~What are the pros and cons of other options (from the webinar and/or as suggested by members)?~~

- What are the implications of shifting from first draw samples to another type of sample, such as a lead service line sample?
- What are the advantages/disadvantages of a single prescriptive liter versus a site-specific sequential sampling approach?
- What are the pros and cons of other options (from the webinar and/or as suggested by members)?
- Under what conditions could OCCT be based on the lead results from the lead service line samples?

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Commented [GB1]: I'm not sure I understand this question. Doesn't OCCT get triggered from the results? This is worded as if it's a change.

Commented [MR2]: Gail,
I don't think this question is necessary with my addition to the second bullet asking about another type of sample. The idea that the question is trying to get at is that LSL samples will likely push many systems into corrosion control (which haven't yet had to do it), and will likely have many systems with CCT reoptimizing or going into LSLR. A better question would be, "What are the implications of moving to a lead service line sample?"

12:15-1:30 LUNCH *[on your own]*

1:30-1:45 Public Comment

1:45-3:00 Discussion: Sampling Protocols: Implementation Questions
Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

Commented [MR3]: I think these questions should go at 3:30.

- In the context of the morning discussion,
  - Who should collect samples? The PWS? The homeowner/resident? If the latter, how can the procedure be reliably executed? How can instructions to homeowners/residents be as clear and easy to follow as possible?
  - What are the pros and cons of addressing pre-stagnation flushing of pipes? How should this issue be addressed, if at all? What is the best way to represent the water in the service line?
  - Should aerator removal be addressed? If so, how?
  - ~~What are the pros and cons of addressing pre-stagnation flushing of pipes? How should this issue be addressed, if at all? What is the best way to represent the water in the service line?~~

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3:15-3:30 BREAK

3:30-4:30 Discussion: Sampling Protocols: Implementation Questions *[continued]*
Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

Commented [MR4]: Gail,
I think these questions should go at 1:45.

- What is an appropriate number of samples to be collected by a water system to capture the highest risk lead and copper sites in the distribution system and, where CCT is in place that will indicate if the corrosion control is effective in reducing lead? In reducing copper?
  - How important is the size of the PWS population in determining this number?
  - How much does geographic distribution of samples matter, particularly with respect to non-homogenous water quality and non-homogeneous construction distribution?

- What are the implications of invalidation criteria for the number of samples needed?
- What are the implications of adding a maximum residence time for tap samples?
- Other questions from the webinar?

4:30-5:00 Open Discussion

5:00 ADJOURN FOR THE DAY

> **Commented [MR5]:** From Jeff: We may as well put the issue of a maximum residence time (24 hours) on the table and ask specific questions about it – we could do this in the over-arching first session or in the third session as a question just before the invalidation criteria as this is the big issue regarding invalidation. If we add it as a criterion, then it would allow samples to be invalidated if they exceed that threshold. This is something we envision including, so it would be good to get input from NDWAC WG on it. We probably don't need to include the specific 24 hours in the question on the inclusion of a maximum residence time.

> **Commented [MR6]:** From Jeff: This could apply for both first draw samples and service line samples.

Friday, September 19th, 2014

8:45-9:00 Informal gathering

9:00-9:15 Review Day Two Agenda
Objective: Reflections from Day One and confirm agenda for today.

9:15-10:45 Discussion: Public Education for Lead
Objectives: Provide initial input on questions posed by NDWAC WG members or ~~in the white paper and on~~ during the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions: [Note: Gail will call Yanna L to ask what questions she suggests be added with respect to lead PE]

- ~~What are the pros and cons of the 2007 changes to lead public educations?~~
- What suggestions do members have for improvement?
- Other questions from the webinar?

> **Commented [MR7]:** I see where Jerry is coming from, but I disagree and would let this question stand because it will bring out the issues and let the group discuss them. Jerry's right, though, we'll know better the issues after the PE webinar.

> **Commented [EJ8]:** I think we should wait to get Yanna's issues added to the agenda before adding this question. After I know what the issues are with the existing requirements, I can provide input on what questions to ask.

10:45-11:00 BREAK

10:45-12:15 Discussion: Public Education for Copper
Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- Are there aesthetic warning signals of copper corrosion in drinking water and, if so, what are they and what recommendations should be given to consumers to help them avoid the health effects of copper through consumption of drinking water?
- Should copper public education materials be included in the LCR using the same basic structure as the public education materials for a lead action level exceedance?
- Should different types of outreach materials to consumers with different content be required depending on whether or not the copper action level is exceeded? If so, what information should be included (e.g., public education for an action

level exceedance, informational statement about copper if an action level is not exceeded)?

12:15-1:30 LUNCH *[on your own]*

1:30-1:45 Public Comment

1:45-2:45 Discussion: Public Education for Copper *[continued]*

Objectives: Provide initial input on questions posed in the white paper and on the webinar. Initial ideas will be included in the meeting summary for members to reflect upon and consider for inclusion in final report.

Suggested Discussion Questions:

- If copper public education materials or informational statements are required, what should the delivery frequency be?
- If public education is not required for copper action level exceedances, should EPA require systems to deliver outreach materials/informational statement to consumers who visit or live in a newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to identify newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to work with local inspection services to incorporate the outreach materials or informational statement into building/dwelling occupancy permits?
  - How much and what kind of direction should be provided by EPA with respect to public education materials or informational statements?
- If a water system demonstrates water quality aggressive to copper, should those consumers receive informational statements about copper? If so, what information should be included?
- Other questions from the webinar?

2:45-3:00 Wrap up and Next Steps

3:00 ADJOURN MEETING

Questions for States

As part of the Lead and Copper Rule Long-Term Revisions (LCR LTR) rulemaking process, EPA is refining the recommendations made by the National Drinking Water Advisory Council (NDWAC) and developing the economic analysis to support the proposed rulemaking. EPA would greatly appreciate your input on the burden (labor) and costs associated with some of the current and potential requirements under the Lead and Copper Rule (LCR). EPA may use some of the information you provide in its economic analysis.

EPA has organized its questions into three section:

- **A. Current Rule Oversight Activities.** This section is designed to obtain state labor estimates for various oversight activities under the current rule.
- **B. Additional Current Rule Implementation Questions.** Includes questions to gather additional information on current rule activities.
- **C. Possible Lead and Copper Rule Long-Term Revision Oversight Activities.** Includes some of the recommendations made by the NDWAC for the LCR LTR and/or those described in EPA's February 29, 2016 letter from Joel Beauvais to state commissioners. It includes questions to obtain estimates of the needed labor to oversee these measures and how they might be implemented.

A. Current Rule Oversight Activities

EPA has provided suggested burden estimates in Column B for state current rule oversight activities. If you disagree with the burden estimate or they vary by system size or type, please provide your estimates in column C. Add additional explanation in Column D.

State Oversight Activity	EPA's Suggested Burden (hrs)	State's Estimated Burden (hrs)	Additional Explanation
(A)	(B)	(C)	(D)
Lead and Copper Tap Monitoring			
Review sample invalidation requests	1 hour/request	2 hrs/request	
Review certification from PWSs that lead results were reported to customer whose taps were sampled	0.1 hrs/certification	0.33 hrs/certification	Includes sorting incoming LCNs, review for proper content, and input into SDWIS
Water Quality Parameter Monitoring			
Review WQP data for PWSs without CCT	2 hrs/6-month period	6 hrs/6-month period	
Review WQP data for PWSs with CCT but for which OWQPs have not been set	2 hrs/6-month period	6 hrs/6-month period	
Review WQP data to determine compliance with OWQPs	3.5 hrs/6-month period	40 hrs/6-month period	

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State Oversight Activity	EPA's Suggested Burden (hrs)	State's Estimated Burden (hrs)	Additional Explanation
(A)	(B)	(C)	(D)
Corrosion Control Treatment [1]			
Determine if PWSs serving ≤ 50,000 people must conduct a study	4 hrs (≤ 3,300) to 16 hr (10,001-50K)	4 hrs (≤ 3,300) to 16 hrs (10,001-50K)	Per system
Determine CCT if no study is conducted (includes time for state to conduct analogous system review)	16 hrs (≤ 100) to 80 hrs (10,001-50K)	24 hrs (≤ 100) to 80 hrs (10,001-50K)	Includes system and Regional Office consultation & preparation of approval letters. ~~*Indicate if burden includes time for state to conduct analogous system review*~~
Determine CCT if study is conducted [2]	8 hrs (3,301-10K) to 16 (10,001-50K)	16 hrs (3,301-10K) to 24 hrs (10,001-50K)	(For pipe loop study) *Indicate the type of study reviewed (e.g., pipe loop, desktop)*
Set OWQPs	2 hrs (≤ 500) to 12 hrs (10,001-50K)	2 hrs (≤ 500) to 12 hrs (10,001-50K)	Per system
Public Education			
Review certification that public education was properly conducted	0.1 hrs/certification	0.33 hrs/certification	Includes sorting incoming PEs, review for proper content, and input into SDWIS
Notes [1] Number in parentheses indicates the system size by its population served. [2] Assumes systems serving 3,300 or fewer would be required to conduct a CCT study.			
Acronyms: CCT = corrosion control treatment; OWQP = optimal water quality parameter; PWS = public water system; WQP = water quality parameter			

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B. Additional Current Rule Implementation Questions

1. Sample Invalidation. On average, how many invalidation requests do you receive per year? Please indicate if it differs by system size/type (e.g., 20 for CWSs ≤ 3,300; 10 for CWSs > 50K; 0 for NTNCWSs). 1-2 invalidation requests per year
2. Monitoring for WQP monitoring.
   a. In general, do all systems have pH and conductivity meters including those that never had an action level exceedance? If not, please explain. "Yes" (for medium to large systems); generally "no" for small systems.

b. Which WQP analyses do PWSs tend to conduct in-house? Please indicate if this varies by system size and type (i.e., community water system, non-transient non-community water systems). pH, temperature and conductivity (for medium to large systems)

3. CCT Re-assessment. Have you required any of your systems to re-assess CCT?

   a. If so, what triggered this requirement? Continue to exceed after treatment installation, change in source water or treatment

   b. What steps did you require? Re-do CCT desktop study (141-C); take more WQPs; include calculations for CSMR (chloride sulfate mass ratio); prepare technical memo/study to evaluate proposed treatment change on existing corrosion control

   c. What timeframe did you give them to complete each step? For desktop study – to be completed within 6 months after exceedance; for other steps – on a case-by-case basis.

   d. On average, how much time did you spend working with systems on each step? Please indicate if this varied by system size or type. 2 hrs per step (includes Regional Office & Central Office staff time); more time required for smaller systems, especially for their first time exceedances.

4. Change in Source or Treatment

   a. How much time do you spend reviewing a proposed change in source? For groundwater to groundwater - ~ 2 hrs (expect system to submit WQPs to determine if similar sources) time also includes phone calls, emails, and Regional Office interaction. For surface water source changes or surface water/groundwater mixing - ~ 3 hours (generally will need to change systems' monitoring schedules (wholesalers and purchasing systems). Please list factors that would affect this estimate. E.g., system size; whether the change is to a similar source, such as a ground water source within the same aquifer; if system has CCT. Factors include system size, number of purchase systems, and whether the change is to a similar source within same aquifer with similar WQPS.

   b. How much time do you spend reviewing a proposed change in treatment? Please list factors that would affect this estimate. E.g., system size, if system has CCT. For small systems ~1-2 hrs; For large systems >50K estimate ~80 hours (usually involve meetings, plant tours, and review and discussion of documentation/results).

   c. What types of actions have you asked a system to undertake as a condition of approving this change? Additional WQP monitoring, provide documentation that proposed chemical is NSF approved, and return the system to standard 6-month monitoring. What factors influenced this decision? Data results, what sources are being mixed, and type of disinfectant change (especially if changing to chlorine dioxide).

5. Lead Service Line Replacement

   a. When were LSLs no longer used in your state? N/A

   b. Were lead goosenecks and pigtails used in your state? Yes

   c. Do you have any information on LSLR costs? No

C. Possible Lead and Copper Rule Long-Term Revision Oversight Activities

1. Lead Sampling Instructions. Systems may be required to update their first-draw sampling instructions to preclude removal and cleaning of the aerator and pre-stagnation flushing prior to sample collection. They may also be required to develop instruction for additional protocols, such as collection of samples from a lead service line (LSL) or grab samples.

    a. If EPA developed templates for these instructions, is 0.25 hrs per system a reasonable estimate for states to send each system these templates? Yes

    b. If LSL samples are required, EPA envisions that states will need to consult with systems on this new sampling procedure. Is an estimate of 2 hours/system with LSLs reasonable? Yes

2. Update the Materials Inventory. Systems may be required to update their materials inventory that was originally conducted under the LCR to more thoroughly identify sites with LSLs including lead goosenecks or pigtails.

    a. In addition to reviewing building department records what other steps do you think the system might undertake to update their inventories? Check information on year house built, homeowner's statement; on-site inspection of plumbing and/or meter box; scratch or swap tests; check old records on file with the State;

    b. What is your best estimate for the labor needed to review a system's updated materials inventory? Please provide a range if this varies by system size. 4 - 8 hrs per system

2. Annual review of lead Information. The NDWAC recommended that primacy agencies review an annual report of the three most current years of all lead tap monitoring information.

    a. Do you think you would require all systems to submit this report? No. If not, for which subset would you require this report? Would not require since already have data in SDWIS; therefore, systems do not need to submit.

    b. What is your best estimate for the time needed to review this report? Please provide a range if this varies by system size. No answer – uncertain of the purpose of this review.

3. Discussion of sampling data during sanitary surveys. The NDWAC recommended that primacy agencies and systems discuss lead sampling results during sanitary surveys. How many additional hours (or fraction of hours) would this involve? ~0.5 hrs to gather/review data for Regional Office; Regional Office activity/discussion on-site with system representative ~ 1hr.

4. Water aggressiveness to copper determinations. Systems may be required to conduct an initial and on-going demonstration of their water aggressiveness to copper. Possible approaches include: 1) WQP testing, 2) a pipe loop study, or 3) collecting samples from newer homes.

    a. Do you have a sense of which of the three methods a system might select? Small-medium system most likely to use WQP testing or collecting samples from newer homes. Large systems may use all three approaches.

    b. What factors would influence this decision? Cost; system size; age of homes within system.

5. Control charting.

a. Do any of your systems currently conduct control charting of their WQPs? Probably some of the large systems.

b. If EPA required control charting but provided flexibility for the system or state to conduct it, do you think your state would opt to do this analysis for all or a subset of systems? If so, please explain. State may do a subset on a case-by-case basis.

c. If conducted by your state, how many hours do you estimate would be needed? Please indicate if this varies by system size or type. If data exists, State may do, for example, a scatter chart that would take ~ 1 hr per large system, per parameter.

6. Periodic Review of Updated CCT Guidance. Under the LCR LTR, states may be required to periodically review updated CCT guidance and work with systems serving ≤ 50,000 people to determine if a CCT change is warranted. How many hours do you think would be needed to:

a. Review this EPA guidance? Please indicate the basis of your assumptions. Depends on volume and content of new guidance.

b. Consult with systems? Please indicate the basis of your assumptions. Depends on volume and content of new guidance.

7. Non-LSL-demonstration. NDWAC recommended that a service line be considered a LSL unless demonstrated otherwise.

   a. If states were provided discretion to make this demonstration for systems, do you think your state would do so for all systems, a subset of systems (please specify), or none? None

   b. If the system is required to make this demonstration, how many hours do you estimate your state would need to review information submitted by the system. Please provide a range if this varies by system size. May depend on number of service connections; then perhaps 0.5 hrs per service connection.

   c. If the state makes this demonstration: N/A

      i. Please describe the steps you would take to make this demonstration and estimated associated number of hours.

      ii. What information you would need from the system?

Message

From:	Roberson, Alan [aroberson@asdwa.org]
Sent:	3/9/2018 4:42:09 PM
To:	Helm, Erik [Helm.Erik@epa.gov]
CC:	dosterhoudt@asdwa.org
Subject:	Re: the importance of public education and LSL replacement
Attachments:	FInal LT_LCR Federal Consultation ASDWA Comments_Appendices.pdf

Erik, more not-so-good news on the data front as I talked with Darrell and we don't have the data that you need. That being said, at some point down the road, maybe the three of us can meet and talk about your data needs as I am willing to go out to the states once with a survey.

Not sure if these have trickled down to you yet, but enclosed are our LCR comments that were submitted yesterday. Alan

On Thu, Mar 8, 2018 at 3:08 PM, Helm, Erik <Helm.Erik@epa.gov> wrote:

> Thanks Alan,
>
> I did ask Steve as well, if anything new comes to mind let me know.
>
> By the way would you know if any of your states have collected data on the number or percent of LSLR under the current rule's action level exceedance 7% LSL replacement requirements, are actually "test outs"?
>
> erik
>
> ---
>
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From: Roberson, Alan [mailto:aroberson@asdwa.org]
Sent: Thursday, March 08, 2018 2:53 PM
To: Helm, Erik <Helm.Erik@epa.gov>
Cc: dosterhoudt@asdwa.org
Subject: Re: the importance of public education and LSL replacement

Erik, I can honestly say I don't know of any data that might help you out. That being said, I think Steve Via from AWWA (who I have cc'ed on this message) might be able to steer you to 9 water systems that are working hard on voluntary LSLR. I know a few now:

- Boston Water & Sewer Commission
- Cincinnati Water Works
- Maybe Philadelphia Water
- Maybe American Water

Steve is going to be at our Member Meeting on Monday so I can chat with him about this issue a bit...

Alan

On Wed, Mar 7, 2018 at 1:36 PM, Helm, Erik <Helm.Erik@epa.gov> wrote:

Alan and Darrell,

As part of the analysis of benefits and for that matter the timelines for regulatory compliance under LCR regulatory options, I have started thinking about how you would quantify the change in LSLR that results from the increases in public education. I'm trying to basically figure out how affective PE is at changing people's behavior with lead service line replacement. This would help in general with determining the benefits of requiring new PE, and it would also help with the analysis of the NDWAC recommendations for an LSLR program that triggers PE when goals are not met.

Has ASDWA or any states collected quantitative information of PE metrics like the number of times households are contacted under the LCR rule or voluntary LSLR programs and homeowners willingness to pay for the private side replacement? Or could you point me to a number of systems (no more than 9) that are currently engaged in a voluntary LSLR program, so I might collect data across those systems and look at their variation to determine some sort of relationship.

Thanks very much for your assistance. Please any thoughts you have on the topic would be appreciated.

Erik

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Optimization of Phosphorus-Based Corrosion Control Chemicals Using a Comprehensive Perspective of Water Quality

Project #4586

Optimization of Phosphorus-Based Corrosion Control Chemicals Using a Comprehensive Perspective of Water Quality

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The Water Research Foundation (WRF) is a member-supported, international, 501(c)3 research cooperative that advances the science of water to protect public health and the environment. Governed by utilities, WRF delivers scientifically sound research solutions and knowledge to serve our subscribers in all areas of drinking water, wastewater, stormwater, and reuse.

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Optimization of Phosphorus-Based Corrosion Control Chemicals Using a Comprehensive Perspective of Water Quality

Prepared by:
Abigail F. Cantor
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Jointly sponsored by*:
Water Research Foundation
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and

Water Environment & Reuse Foundation
1199 N. Fairfax Street, Ste 410, Alexandria, VA 22314

*The co-sponsoring utilities wished to remain anonymous.

Published by:

Water Research Foundation℠

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ISBN 978-1-60573-313-5

Printed in the U.S.A.

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FOREWORD

The Water Research Foundation (WRF) is a nonprofit corporation dedicated to the development and implementation of scientifically sound research designed to help water utilities respond to regulatory requirements and address high-priority concerns. WRF's research agenda is developed through a process of consultation with WRF subscribers and other water professionals. WRF's Board of Directors and other professional volunteers help prioritize and select research projects for funding based upon current and future industry needs, applicability, and past work. WRF sponsors research projects through the Focus Area, Emerging Opportunities, Tailored Collaboration, and Facilitated Research programs, as well as various joint research efforts with organizations such as the U.S. Environmental Protection Agency and the U.S. Bureau of Reclamation.

This publication is a result of a research project fully funded or funded in part by WRF subscribers. WRF's subscription program provides a cost-effective and collaborative method for funding research in the public interest. The research investment that underpins this report will intrinsically increase in value as the findings are applied in communities throughout the world. WRF research projects are managed closely from their inception to the final report by the staff and a large cadre of volunteers who willingly contribute their time and expertise. WRF provides planning, management, and technical oversight and awards contracts to other institutions such as water utilities, universities, and engineering firms to conduct the research.

A broad spectrum of water issues is addressed by WRF's research agenda, including infrastructure and asset management, rates and utility finance, risk communication, green infrastructure, food waste co-digestion, reuse, alternative water supplies, water loss control, and more. The ultimate purpose of the coordinated effort is to help water suppliers provide a reliable supply of safe and affordable water to consumers. The true benefits of WRF's research are realized when the results are implemented at the utility level. WRF's staff and Board of Directors are pleased to offer this publication as a contribution toward that end.

Charles M. Murray
Chair, Board of Directors
Water Research Foundation

Robert C. Renner, PE
Chief Executive Officer
Water Research Foundation

ACKNOWLEDGEMENTS

This project is the culmination of years of development of the author's approach to distribution system water quality control. There are many people to thank whose input helped to form the approach and also helped to carry out this project.

Eric Kiefer, Manager of the North Shore Water Commission water treatment plant in Glendale, Wisconsin, is an "early adopter" (Rogers 2003) of ideas and technologies. He has involved the PRS Monitoring Station in two Water Research Foundation projects (Project #4286 and this project, Project #4586) as well as in making a critical operational change at the water treatment plant. His involvement with the PRS Monitoring Station has called the technique to the attention of the Water Research Foundation and others in the drinking water field.

Kevin Shafer, Executive Director of the Milwaukee Metropolitan Sewerage District and Chairman of the Water Environment Research Foundation Board, initiated this project in a quest for minimizing phosphate contributions from municipal drinking water to wastewater treatment facilities. Timothy Bate, P.E., Director of Planning, Research and Sustainability at the Milwaukee Metropolitan Sewerage District, also worked to initiate the project and attended planning meetings. He retired during this project and left Matthew Magruder, Environmental Research Manager, in the project. Matt went on to aid in collecting data from the wastewater treatment facilities in this study and to edit Chapter 12 on phosphorus removal from wastewater, giving a big boost to the development of that material.

Two other Wisconsin wastewater treatment facility managers took an interest in this project and volunteered time to planning the wastewater approach and to editing Chapter 12. Tom Steinbach, manager of the Oconomowoc, Wisconsin wastewater facility, and Sam Warp, manager of the Marshfield, Wisconsin wastewater facility, both donated time and excellent ideas for development of the wastewater chapter.

Continuing with support from the wastewater side of the water equation, this project could not have been carried out without the generous grant from the Water Environment Research Foundation and the involvement of Walter Graf, Program Manager.

On the drinking water side of the water equation, this project also would not be possible without the generous grant from the Water Research Foundation. Jonathan Cuppett, Project Manager, helped pave the way for making this project a reality and keeping it on track.

Water Research Foundation Project Advisory Committee members, Jeff Swertfeger, Assistant Superintendent of the Greater Cincinnati Water Works, and Zeke Campbell, Superintendent of Water Quality in the Denver Water Utility, donated their time to commenting on project progress reports every three months and on the draft manuscript of the final report. Their comments were invaluable in helping to communicate the ideas in this project.

The project team consisted of twelve Wisconsin water utilities. It has been requested that the utilities remain anonymous. Managers, operators, engineers, and chemists from these utilities all participated in project meetings and in carrying out the detailed work in gathering the distribution system data. Project meetings began about six months before the original grant proposal was submitted and continued throughout this multi-year project. Meeting discussions became a great exchange of ideas and were important in shaping the outcome of this project. These utilities and personnel donated financial support, labor, and planning time; they were the engine keeping this project moving forward.

Federal and state drinking water regulators also took an interest in this project and donated time to participate in project meetings and in editing the report manuscript. Miguel del Toral,

Regulations Manager for the U.S. Environmental Protection Agency (EPA) of Region 5 Groundwater and Drinking Water Bureau in Chicago also arranged for the donation of water analyses from the EPA laboratory in Chicago. With this donation, the project was able to carry out profile sampling in two residences of five Lake Michigan water systems.

At the State of Wisconsin regulatory level, Steve Elmore, Director of the Department of Natural Resources Bureau of Drinking Water and Groundwater, and Mark Nelson, Water Supply Specialist with a focus on the Lead and Copper Rule, both participated in this project in its planning stages and throughout by attending project meetings and offering comments on project activities. Mark Nelson retired during this project; Bridget Kelly took his place at the Bureau and actively participated in this project. Cathrine Wunderlich, Chief of Public Water Engineering, and Adam DeWeese, Chief of Public Water Supply, along with Bridget Kelly, all became involved in reading the draft report and setting aside time to discuss aspects of the findings. This project has greatly benefited from this direct involvement and interest of drinking water regulators.

On the corporate side, Jason Peters, Vice President of Product Development at Blue Earth Labs LLC, participated in project meetings and in editing the report manuscript. In addition, he made arrangements for his company to support disinfection by-product sampling at one of the sites where his company's product, Clearitas®, was utilized.

Dr. J. Barry Maynard, currently retired geology professor from the University of Cincinnati, has analyzed the chemical scales on the PRS Monitoring Station metal plates since 2006 when the first PRS Monitoring Station was installed. His insight into chemical scales in drinking water systems has added an important dimension to the use of PRS Monitoring Stations and his analyses have uncovered key aspects of lead and copper release mechanisms.

Dr. Andrew Jacque, P.E., Founder and Chief Scientist of Water Quality Investigations, LLC, has made tremendous strides in uncovering how microorganisms participate in water chemistry and in shaping water quality. The report author, Abigail Cantor, and Dr. Jacque, met many years ago in a mutual quest for improved methods for measuring the population of microorganisms in water and on pipe walls. They have collaborated on many projects since that time, during which time Dr. Jacque has expanded the possibilities of microbiological materials measurement and interpretations of the data.

Dr. Kevin Little, statistician and Founder of Informing Ecological Design, LLC, has been an important mentor to Abigail Cantor on the use of statistical techniques for the analysis of drinking water monitoring data. Dr. Little was the first to suggest that the Shewhart Control Charts be used for this purpose. He has also introduced other concepts regarding data presentation and statistical programming language. This quantity of data could not be handled without the techniques that he promotes.

Rob Spence, vice-president of the Rundle-Spence Company -- plumbing, heating, well, and septic equipment distributor -- and mechanical engineer, took on the task of improving the design of Process Research Solutions' Monitoring Station and assembling the stations for water utilities starting around 2009. He has made it possible to easily produce and install a monitoring station in a distribution system to get a water quality monitoring program underway.

EXECUTIVE SUMMARY

KEY FINDINGS

- If planning to use orthophosphate, perform a phosphorus environmental impact analysis in coordination with the wastewater treatment facility
- It should never be assumed that orthophosphate use is applicable to all water systems or that its use provides guaranteed protection from exposure to lead or copper
- The comprehensive perspective of water quality includes routinely improving infrastructure, adopting an ongoing biostability improvement program, and maintaining an ongoing corrosion control plan

OBJECTIVES

When controlling lead and copper release from piping materials into drinking water, choices are limited. Orthophosphate addition and pH/alkalinity adjustment are the two commonly used lead and copper control strategies and are the focus of the Lead and Copper Rule. Both methods are utilized to create a protective chemical barrier on metal surfaces that inhibits further corrosion of the metal. The science behind these methods is well understood. But, how are these chemical interactions carried out in actual water systems where many other chemical and microbiological interactions are occurring at the same time? This question was explored in this project.

The objectives of this project were:

- To measure the effects of lead and copper orthophosphate and carbonate compounds in the complex chemical and microbiological environment of drinking water systems
- To observe the effects on lead and copper orthophosphate and carbonate compounds as some of the chemical and microbiological factors were removed from the water environment. This was accomplished by removal of pipe wall accumulations and by creation of a water environment where microorganisms could not grow excessively.
- To assess the impact of phosphates on the environment and on wastewater treatment facilities after the phosphates have left the drinking water system

BACKGROUND

Phosphorus-based chemicals have a long history of use as additives in drinking water systems, especially in pulling calcium, iron, and manganese compounds off of system structures and holding the metals in solution (sequestration). Other phosphate chemicals successfully act in an opposite manner by dropping metals out as insoluble compounds on metal surfaces that can, in some cases, inhibit corrosion of those surfaces.

In 1991, phosphorus-based chemicals took on even more importance in drinking water systems. This was the year that the Lead and Copper Rule was first published. Historical use of phosphates in drinking water systems and years of phosphate-oriented research led up to the publishing of the Rule, with emphasis on the use of orthophosphate for control of uniform corrosion of lead.

In 2017, the United States Environmental Protection Agency (EPA) is poised to rewrite and republish the Lead and Copper Rule. EPA documents imply that a greater focus will be placed on the use of orthophosphate. For lead control, there are suggestions that the dosage should be increased to around 3.5 mg/L as PO_4 from current common dosages of 0.3, 1, and 3 mg/L as PO_4. In addition, a new emphasis will be placed on copper corrosion control. Regarding copper corrosion, many water systems not now using orthophosphate may be required to begin orthophosphate addition.

As an alternative to orthophosphate addition for lead and copper corrosion control, the Lead and Copper Rule also allows for alterations to alkalinity and pH of the water. Manipulation of alkalinity, pH, and orthophosphate concentration for lead and copper corrosion control come from a fundamental concept of how lead and copper are released into water from piping materials. The Lead and Copper Rule is based on this fundamental concept and maintains that either lead or copper carbonates or lead or copper orthophosphates will form a uniform barrier on pipe walls to inhibit further lead or copper corrosion and release.

However, analyses of system water and pipe wall accumulations in actual water systems show a more complex composition than described by the carbonate- or the orthophosphate-solubility models. This project explored whether lead or copper orthophosphate and carbonate compounds could continue to provide corrosion control in the presence of these observed chemical and microbiological interactions actually occurring in water systems.

In bringing more of the observed complexity into this study of water systems, components of system water and of pipe wall accumulations were grouped into three general categories for organizational purposes:

1. Uniform corrosion products, including not only carbonates and orthophosphates but also oxides, chlorides, and sulfates
2. Water biostability parameters, including microbiological populations, the presence of biofilms, the presence of nutrients for microorganisms (organic carbon, nitrogen, and phosphorus compounds), and the presence of disinfection
3. Chemical scale formation and dissolution parameters, including a number of metals in both dissolved and particulate form, such as iron, manganese, and aluminum

In addition, this project looked at the fate of phosphates after they leave the drinking water system. At the same time that drinking water systems are becoming more dependent on phosphorus-based water treatment products, there is an urgency to decrease the release of phosphorus to waterbodies since phosphorus creates a number of environmental issues. Therefore, it is now imperative that an assessment be made to determine how wastewater treatment facilities will be impacted by additional phosphorus contributed from drinking water.

APPROACH

This project involved the following tasks:

- Gather existing information on each water system
- Characterize each existing water system using comprehensive monitoring techniques, including special distribution system monitoring stations

- Clean each water system with uni-directional (high velocity) flushing and, optionally, a biofilm-removing chemical while monitoring. To the extent possible, control factors that can influence excessive growth of microorganisms.
- Continue monitoring as the water system comes to a new steady state of lead and copper release

Data from flowing system water, monitoring station test chamber stagnating water, and test chamber metal plate accumulations were used to determine the relationships between lead and copper release and their various possible influencing factors.

RESULTS/CONCLUSIONS

This project set out to determine whether development of passivating barriers on pipe walls for corrosion control can be successfully carried out in water systems where many other chemical and microbiological interactions occur at the same time.

It was found that passivating barriers are not guaranteed to form on pipe walls. Lead and copper carbonates, expected by the carbonate solubility models used as a foundation for the Lead and Copper Rule, formed on the test chamber metal surfaces, but many other chemical compounds and biofilms formed as well. A high rate of lead and copper release was measured initially in the test chambers from the bare metal surfaces. The rate of lead and copper release dropped over time – from one month to one year – in the different water systems, most likely as carbonate barriers formed. Then, other factors influencing chemical scale and biofilm development appeared to become more dominant in controlling the quantity of lead and copper released. In water systems, there are few pipes that remain as bare metal; most pipes develop complex structures of chemical scales and biofilms. It is doubtful that a passivating film could physically form a uniform barrier against the pipe wall, much less compete with the other influencing factors.

In studying the accumulations on the metal surfaces in the test chambers, there was not just the one lead or copper carbonate compound expected by the carbonate solubility models. Instead, there were mixtures of types of lead or copper carbonate compounds, as well as lead or copper oxides. There were also other elements, such as iron, manganese, aluminum, phosphorus, and sulfur. In addition, there were thermodynamically unstable amorphous compounds observed on the plates, not just the thermodynamically stable crystalline compounds assumed by the equilibrium-based carbonate solubility models. There were also chemical scales observed containing lead and copper that had the potential to crumble into the water and transport lead or copper as particulate matter, another aspect not considered in the carbonate solubility models. To add to this chemical complexity, a presence of biofilms was quantified on each metal surface.

Given the lack of correlation to lead and copper release in this project, and the complex nature of the metal surface accumulations observed, the models of lead and copper carbonate solubility used by the Lead and Copper Rule to predict lead and copper release do not adequately represent the set of circumstances actually found in drinking water distribution systems.

This is not to say that the lead and copper carbonate solubility concept should not be considered. Instead, this is an observation that carbonate solubility is only one of many factors that control the release of lead and copper in water distribution systems. The major water quality parameters of the carbonate concept, alkalinity and pH, must always be considered in an evaluation of lead and copper control along with two other groups of water quality parameters identified on the metal plates – parameters related to chemical scale formation and biostability of the water.

Forming passivating barriers with orthophosphate addition was also studied. As with a carbonate-based passivating barrier, it was physically difficult to form a uniform barrier against metal surfaces, and to compete with the other influencing factors, where other chemical scales and biofilms were also forming. Only one water system showed adequate formation of the desired lead and orthophosphate mineral, pyromorphite. That water system, though, released lead where fifty percent was in particulate form, not known to be controlled by pyromorphite, and had a strong relationship of lead and copper release to a microbiological nitrification process occurring seasonally in the distribution system.

In addition, three of the water systems dosing a phosphate corrosion control chemical showed trends between increasing lead and/or copper with increasing phosphorus in the water. This was either because of sequestration by the polyphosphate fraction of the corrosion control chemical or it was from the sloughing of biofilms and organically-bound phosphorus and metals.

This does not mean that orthophosphate is not a viable tool for corrosion control. It should always be considered in a comprehensive approach to corrosion control, but placed within proper context. It should never be assumed that its use is applicable to all water systems or that its use provides a guaranteed protection from exposure to lead or copper for consumers.

These project findings aside, orthophosphate addition and pH/alkalinity adjustment have been applied to water systems since the Lead and Copper Rule was published in 1991. There are many water systems that have achieved Lead and Copper Rule compliance using these techniques, and lead exposure around the country has been greatly reduced since the Rule was enacted. This project demonstrated that the reason a water system achieved a certain outcome for water quality may be difficult to pinpoint. The pH/alkalinity adjustment or orthophosphate dosing is most likely effective in specific water systems, but the effectiveness of orthophosphate and pH/alkalinity adjustment may be an illusion in other water systems for a number of reasons:

- Several water quality parameters can play a role in both chemical and microbiological interactions, and the true reason that adjustment of the specific water quality parameter is effective for lowering lead and copper release has not been properly identified
- Other water system operations, such as carrying out a high velocity flushing program, reducing system residence time, better eliminating nutrients, or filter cleaning, are occurring simultaneously to the presumed corrosion control strategy and are actually the real influencing factors on corrosion control
- Follow up sampling of the outcome of the corrosion control strategy is inadequate and not representative of actual effectiveness

In terms of other influencing factors in the water systems, a strong relationship was found between particulate lead and copper release and the presence of particulate iron, manganese, and aluminum. In addition, multiple pathways by which microorganisms and their life cycles can cause microbiologically influenced corrosion systemically in a water system were identified.

To control these influences, some of the water systems were cleaned of large quantities of pipe wall iron, manganese, and aluminum particulates by means of high velocity, uni-directional flushing. In addition, the biostability of the water was improved by removing biofilms with the high velocity flushing, decreasing nutrients entering the water system with well rehabilitation and cleaning, and conducting water treatment filter rehabilitation and cleaning. Water systems that underwent these system hygiene activities in this project had lower lead and copper release in the monitoring station test chambers and in Lead and Copper Rule compliance sampling.

In general, the findings of this project emphasized the benefits of a comprehensive perspective for control of distribution system water quality issues, including lead and copper release. This perspective considers that water quality is shaped by complex interactions of drinking water, which is a potpourri of natural and treatment chemicals and naturally-occurring microorganisms, and pipe wall accumulations of various chemical scales and biofilms. No scientific formula can predict the characteristics of the final water quality. All distribution system water quality issues (discolored water, disinfection byproducts, presence of pathogens, release of lead and copper, etc.) are interrelated; they are all manifestations of the complex interactions between a complex solution of water and a complex composition of pipe wall accumulations.

APPLICATIONS/RECOMMENDATIONS

The Lead and Copper Rule is relatively straightforward to carry out. The comprehensive perspective of water quality is not. How can practitioners who have a multitude of water system operational demands and budget constraints control lead and copper release by applying the comprehensive perspective? The following is a list of recommendations:

Routinely Improve Infrastructure

- Develop a plan to remove lead and galvanized iron service lines
- Develop a water main replacement program
- Develop and carry out routine high velocity flushing of water mains
- Use chemical cleaning aids, where applicable, and use them cautiously
- Clean other water system components, such as storage tanks and filters

Adopt an Ongoing Biostability Improvement Program

- Understand the role that microorganisms play in shaping water quality and interacting with water chemistry
- Perform routine biostability tracking and improvement for source water, wells, filters, storage tanks, and high capacity pipe lines
- Prevent microbiological nutrients (organic carbon, nitrogen compounds, and phosphorus compounds) and microbiological populations from entering the water system
- Provide adequate disinfection throughout the water system
- Reduce residence time of water in the system

Maintain an Ongoing Corrosion Control Plan

- Do not define the corrosivity of water based on pH and alkalinity alone or based on predictions of the carbonate-solubility models. They do not adequately represent the set of circumstances found in water systems. The comprehensive perspective must be incorporated into insights regarding water system lead and copper release.
- Keep an updated desktop study and timeline for each water utility as demonstrated in this report. See Chapter 2.
- Perform a routine distribution system water quality indicator study using frequently visited sites, such as the Total Coliform Rule sampling sites, with disinfection

concentration and turbidity data. Troubleshoot operations when disinfection concentrations are low or turbidity is high. See Chapters 4 and 11.

- Study the water in problematic buildings identified by Lead and Copper Rule compliance sampling or customer complaints. The profile sampling used in this study is one good sampling method. See Chapter 3.
- If possible, routinely gauge lead and copper release from a special monitoring station, pipe loop, or accessible building. See Chapters 5 to 11.
- Consider using orthophosphate or pH/alkalinity adjustment in water systems under certain circumstances, but with continuation of water system hygiene protocols
- If planning to use orthophosphate, use a product with little to no polyphosphate fraction
- If planning to use orthophosphate, use a dose adequate to form the desired phosphate minerals within the existing pipe wall accumulations
- If planning to use orthophosphate, perform a phosphorus environmental impact analysis in coordination with the associated wastewater treatment facility. See Chapter 12.

READING THIS REPORT

Because of the amount of material in this report, it is recommended that Chapter 1, Chapter 13, and Chapter 14 be read first as an overview.

When following recommendations in Chapter 14, details of maintaining an ongoing corrosion control plan can be found in individual interior chapters.

SUMMARY

This report challenged common understandings of lead and copper corrosion control. The goal of the project was not to tear down institutional concepts, but to build up a larger perspective – to look at lead and copper release more comprehensively, to treat the problems and not the symptoms, and to add more tools to the toolbox.

RELATED WRF RESEARCH

- Controlling Lead in Drinking Water, project #4409
- Impact of Phosphate Corrosion Inhibitors on Cement-Based Pipes and Linings, project #4033
- Optimizing Corrosion Control in Water Distribution Systems, project #2648

CHAPTER 1
INTRODUCTION

In control of lead and copper release from piping materials into drinking water, choices are limited. A common method is to add orthophosphate to the water. The science behind orthophosphate's ability to inhibit metals corrosion is well understood. But, how are orthophosphate chemical interactions carried out in actual water systems where many other chemical and microbiological interactions are occurring? Can knowledge of the real-world interactions aid in optimizing the use of orthophosphate? These questions were explored in this project.

HISTORY OF PHOSPHORUS-BASED CHEMICALS IN DRINKING WATER

Phosphorus-based chemicals have a long history of use as additives in drinking water systems. An article from 1957 in the *Journal of the American Water Works Association* described uses of polyphosphate at the time (Larson 1957). Practical uses of the chemical revolved around the ability of polyphosphate to hold (sequester) metals in water. It was used for removing minerals from clogged screens and water-bearing formations in wells, removing and preventing the formation of iron and calcium scale on plumbing fixtures, and cleaning accumulations off of interior water main walls when combined with a mechanical pipeline scouring technique.

Polyphosphate was also used in industrial and municipal applications for controlling iron corrosion (Hatch 1941). It was theorized, at the time, that the chemical could also control lead corrosion and was tested in this scenario (Hatch 1941). Lower lead concentrations were found in these specific tests of polyphosphate solutions in contact with lead tubing, however the mechanism by which the lower lead release occurred was misunderstood. At that time, it was thought that the polyphosphate was adsorbed onto metal surfaces or formed a complex on metal surfaces that inhibited the corrosion of metals, such as iron, steel, or lead (Hatch 1941).

Others could not reproduce the benefits of corrosion control using polyphosphates. They were not found to be effective as corrosion control agents (for iron) in stagnant or nearly stagnant water, such as in dead ends or service lines (Larson 1957). Testing in the 1980's found that polyphosphates, instead of inhibiting corrosion, could accelerate it for copper and lead (AwwaRF and DVGW 1996). At that time, polyphosphates became better understood. Investigations showed that polyphosphates, a polymer of orthophosphate ions, eventually breaks apart and reverts to individual orthophosphate ions. It is the orthophosphate ion and not the polyphosphate molecule that provides corrosion control (Holm and Schock 1991; AwwaRF and DVGW 1996). The orthophosphate ion combines with the lead or copper ions in the water to create relatively insoluble compounds that have the ability to sit on the pipe wall and inhibit metals corrosion.

In 1991, phosphorus-based chemicals took on even more importance in drinking water systems. This was the year that the Lead and Copper Rule of the Federal drinking water regulations was first published (Code of Federal Regulations 2010b). Historical use of phosphates in drinking water systems and years of phosphate-oriented research led up to the publishing of the Rule with emphasis on the use of orthophosphate for control of uniform corrosion of lead (AwwaRF and DVGW 1996).

In 2017, the United States Environmental Protection Agency (EPA) is poised to rewrite and republish the Lead and Copper Rule. EPA documents imply that a greater focus will be placed on the use of orthophosphate (EPA 2016a; EPA 2016b). For lead control, there are suggestions that the dosage should be increased to around 3.5 mg/L as PO_4 from current common dosages of 0.3, 1 and 3 mg/L as PO_4 (EPA 2016a). In addition, a new emphasis will be placed on copper corrosion control. On behalf of copper corrosion, many water systems not now using orthophosphate may be required to begin orthophosphate addition (EPA 2016b).

A FUNDAMENTAL PERSPECTIVE OF LEAD AND COPPER CORROSION

Alternative to orthophosphate addition for lead and copper corrosion control, the Lead and Copper Rule also allows for alterations to alkalinity and pH of the water. Manipulation of alkalinity, pH, and orthophosphate concentration for lead and copper corrosion control come from a fundamental concept of how lead and copper is released into water from piping material.

Corrosion of metal occurs by means of a flow of electrons similar to a battery (AwwaRF and DVGW 1996; Peabody 2001). When water contacts metal piping, the pipe provides dynamically changing microscopic locations of anodes and cathodes. Electrons in the metal flow between the anodic and cathodic sites within the solid metal.

Just like a battery, at the anodic sites, the solid metal that has lost electrons is transferred to the adjacent water as a positive ion. In the water, the positively-charged metal ion pairs with oppositely-charged ions. The water can supply several negative-ion choices, such as oxygen and carbonate. By this method, a new dissolved compound is formed.

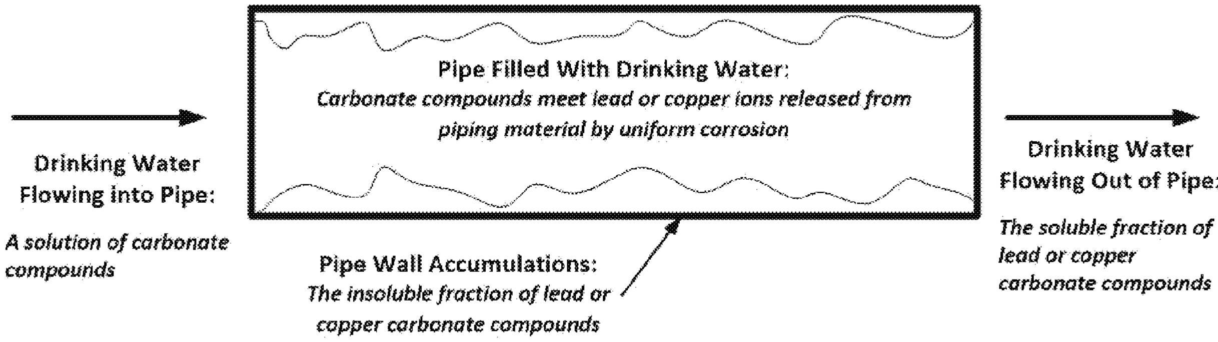
However, the new compound will not stay dissolved in the water if, by nature, it has a low solubility. With a low solubility, the new compound reaches a saturation point quickly and precipitates out of the water onto the metal surface. Some precipitated compounds can create a fine, uniform, non-porous barrier on the metal surface that, in turn, can inhibit the release of metal ions from the piping material into the water.

If the new compound that forms has a high solubility, the dissolved lead or copper concentration in the water increases and metal loss from the piping material continues.

(The process described above is called uniform corrosion. The term uniform corrosion refers to the fact that the anodes and cathodes are dynamically changing and each site on the piping has an equal chance of becoming an anode and losing solid metal to water. The metal is lost uniformly along the pipe surface.)

The Lead and Copper Rule is based on the fact that carbonates, typically found in water, can form compounds with lead and copper ions after they are released from piping materials. Figure 1.1 is a diagram of this concept. Water containing carbonate compounds flows into piping. In the pipe, the water comes in contact with lead and copper ions and form lead and copper carbonate compounds of varying solubility. The insoluble quantity of the lead or copper carbonate compounds can be found on the pipe walls; the soluble fraction of the carbonate compounds can be found dissolved in the water. The more soluble the compound, the more lead or copper is dissolved in the water. In this concept, lead and copper control is a matter of finessing the pH and/or alkalinity of the water to produce a more insoluble compound of lead or copper carbonates.

Alternatively, orthophosphate can be added to form insoluble compounds of lead or copper phosphates. Then, the pipe wall accumulations are composed of orthophosphate compounds, which are more insoluble than lead or copper carbonate compounds. Figure 1.1 can be redrawn with phosphates of lead or copper instead of carbonates.



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.

Figure 1.1 A fundamental perspective of lead and copper release

However, analyses of system water and pipe wall accumulations in actual water systems show a more complex composition than described by the carbonate- or the orthophosphate-solubility models of Figure 1.1. It has been observed in previous investigations by this author that components of system water and of pipe wall accumulations can be grouped into three general categories for organizational purposes:

1. Uniform corrosion products, including not only carbonates and orthophosphates but also oxides, chlorides, and sulfates
2. Water biostability parameters, including microbiological populations, the presence of biofilms, the presence of nutrients for microorganisms (organic carbon, nitrogen, and phosphorus compounds), and the presence of disinfection
3. Chemical scale formation and dissolution parameters, including a number of metals in both dissolved and particulate form, such as iron, manganese, and aluminum

This project explored if lead or copper orthophosphate and carbonate compounds could continue to provide corrosion control in the presence of the various chemical and microbiological interactions actually occurring in water systems.

ENVIRONMENTAL IMPACT OF PHOSPHORUS

In addition, this project looked at the fate of phosphates after they leave the drinking water system. At the same time that drinking water systems are becoming more dependent on phosphorus-based water treatment products, there is increasing urgency to decrease the release of phosphorus to natural bodies of water which creates a number of environmental issues. Phosphorus causes excessive growth of algae and phytoplankton (EPA 2010) and can be the limiting nutrient that triggers this growth (B&V 2014). With the increased mass of dead plant material from the algae population, dissolved oxygen is depleted in the water bodies and other life can no longer thrive (EPA 2010).

In addition to destruction of the aquatic environment, water drawn for drinking water from affected bodies of water can experience water quality problems in the distribution system such as taste and odor problems, deadly cyanotoxins, and increased organic carbon concentrations with the potential for increased carcinogenic disinfection by-product formation (B&V 2014).

Discharge of phosphorus is regulated on federal and state levels. The United States' Clean Water Act requires that states and other regulating entities set goals for protection of individual bodies of water to maintain desired uses. The criteria for a body of water can be based on requirements for possible use as a public water supply or for recreational, commercial, or navigational purposes (EPA 2010).

Once goals and water quality standards are established for a body of water, point source discharges (individual discharge pipelines), such as from wastewater treatment facilities, to that body of water are regulated by means of the National Pollution Discharge Elimination System (NPDES) permitting process (EPA 2010). Because the phosphorus discharge limit is dependent on individual state regulations and the needs of individual bodies of water, discharge limits vary. Typical phosphorus discharge limits are seen to vary between 1 mg/L to 0.02 mg/L as P for the most sensitive bodies of water (B&V 2014).

Therefore, it is now imperative that an assessment be made to determine how the environment and each wastewater treatment facility will be impacted by additional phosphorus contributed from the drinking water.

EXPLORING THE ROLE OF PHOSPHORUS IN DRINKING WATER SYSTEMS

In summary, the objectives of this project were:

- To measure the effects of lead and copper orthophosphate and carbonate compounds in the complex chemical and microbiological environment of drinking water systems
- To observe the effects on lead and copper orthophosphate and carbonate compounds as the water system complexity is controlled by removal of pipe wall accumulations and by creation of a water environment where microorganisms cannot grow excessively
- To assess the impact of phosphates on the environment and on wastewater treatment facilities after they have left the drinking water system

To carry out the objectives, the project involved the following tasks:

- Gather existing information on each water system.
- Characterize each existing water system using comprehensive monitoring techniques, including special distribution system monitoring stations.
- Clean each water system with uni-directional (high velocity) flushing and, optionally, a biofilm-removing chemical while monitoring. To the extent possible, control factors that can influence excessive growth of microorganisms.
- Continue monitoring as the water system comes to a new steady state of lead and copper release.

This report on the completed tasks is organized as follows:

- Chapters 2, 3, and 4 describe the water systems studied in this project using existing information.
- Chapter 5 describes the comprehensive monitoring technique used to characterize the distribution system water quality for the participating water systems.
- Chapters 6 to 11 describe the results of the comprehensive monitoring.
- Chapter 12 describes the assessment of the impact of drinking water phosphate-dosing on wastewater treatment plant facilities and the environment.
- Chapters 13 and 14 discuss conclusions and recommendations from this study.

CHAPTER 2
PARTICIPATING WATER SYSTEMS

The first task of any water system investigation is to gather existing system information to characterize the system components to be studied (EPA 2016a). Existing system information of the participating water utilities is the focus of this chapter.

This project involved information from twelve water utilities. Eight of the water utilities were studied for lead and copper release trends from special distribution system monitoring stations before, during, and after system cleaning efforts. The four remaining water systems contributed existing information to the project. Five of the twelve water systems, the systems which use Lake Michigan as source water, participated in profile sampling of two residences in each water system.

Six wastewater treatment facilities associated with the drinking water utilities in this project were also studied to conceptualize the impact of phosphate-based lead and copper control chemicals on meeting wastewater phosphorus discharge limits.

Table 2.1 lists the twelve water systems and their general characteristics by which they can be grouped. Table 2.2 is a re-sorted list of the water systems of Table 2.1 showing the order in which data are presented in this report.

Table 2.1
Water systems participating in project #4586

Water System ID	Type of Facility	Water Source	Presence of Lead Service Lines	Use of Phosphate Corrosion Control Chemical	Provided Existing Data	Ran Distribution System Monitoring with Monitoring Station	Performed Residential Profile Sampling
A	Municipal	Lake Michigan	Yes	Yes	Yes	Yes + did in the past	Yes
B	Municipal	Lake Michigan	Yes	No	Yes	Yes	Yes
C	Municipal	Lake Michigan	Yes	Yes	Yes	Yes + did in the past	Yes
D	Municipal	Groundwater	Yes	Yes	Yes	Yes	No
E	Campus	Groundwater	No	No	Yes	Yes	No
F	Campus	Groundwater	No	No	Yes	Yes	No
G	Campus	Groundwater	No	Yes	Yes	Yes	No
*H1 and H2	Campus	Groundwater	No	Yes	Yes	Yes	No
I	Municipal	Lake Michigan	Yes	Yes	Yes	No	Yes
J	Municipal	Lake Michigan	Yes	Yes	Yes	No	Yes
K	Municipal	Groundwater	Yes	No	Yes	No + did in the past	No
L	Municipal	Groundwater	No	No (did in the past)	Yes	No + did in the past	No

*Water Systems H1 and H2 are two campuses served by one water system

Table 2.2
Order of water systems in data presentation

Water System ID	Type of Facility	Water Source	Ran Distribution System Monitoring with Monitoring Station
A	Municipal	Lake Michigan	Yes + did in the past
B	Municipal	Lake Michigan	Yes
C	Municipal	Lake Michigan	Yes + did in the past
I	Municipal	Lake Michigan	No
J	Municipal	Lake Michigan	No
D	Municipal	Groundwater	Yes
K	Municipal	Groundwater	No + did in the past
L	Municipal	Groundwater	No + did in the past
E	Campus	Groundwater	Yes
F	Campus	Groundwater	Yes
G	Campus	Groundwater	Yes
*H1 and H2	Campus	Groundwater	Yes

*Water Systems H1 and H2 are two campuses served by one water system

WATER SYSTEM DESCRIPTIONS

The water systems participating in this project are described below.

Municipal Lake Michigan Systems

Water System A is a treatment plant filtering Lake Michigan water. The treatment plant is owned by three water systems that individually oversee their distribution systems. Data in tables of this report describing Water System A are a summation of the three distribution systems' characteristics.

This confederation was started in 1961 when the water treatment plant was built. The distribution systems are tested as one for the Lead and Copper Rule. The Lead and Copper Rule compliance sampling showed the systems to be out of compliance for lead in 1992 and 1995. A polyphosphate/orthophosphate blend where orthophosphate was 50% of the total phosphorus in the product (50/50 poly/orthophosphate blend) was then added to control the lead system-wide.

In 2008, a decision was made to switch the disinfection chemical from free chlorine to chloramine. This was done to make the water compatible with water from a nearby city that would be used in an emergency situation. This was a pro-active decision because there has never been an emergency situation where the nearby city's water was used. In order to make the switch, special distribution system monitoring stations (described in Chapter 5) were installed to characterize the original system's water characteristics, to monitor the water quality, including lead and copper release, frequently during the change of disinfection chemical, and to monitor the water quality over time after the change.

In addition, off-line tests were run using the monitoring stations in a different configuration to compare phosphate-based corrosion control chemicals. A 10/90 poly/orthophosphate blend was found to be more effective at lowering lead levels than the 50/50 blended product and a 70/30 blended product. The orthophosphate kept the lead concentration lower with less particulate lead release and within a more narrow range of concentrations. So, the phosphate corrosion control product was switched two and one-half months before the disinfection chemical. The 10/90 poly/orthophosphate chemical specification has been used since that time.

Lead and Copper Rule sampling in 2009, about ten months after the chemical changes, showed the same water quality responses that the off-line tests and the distribution sampling predicted. That is, average and maximum lead levels were greatly reduced with the new chemical regimen.

During the monitoring of the distribution systems in 2008 through 2010 and in simultaneous and repeated sampling of four residences with lead service lines, a high degree of particulate lead was measured that was not found at the entry point to the distribution system. It was concluded that existing pipe wall debris interacted with the system water to increase the transfer of lead in particulate form into the water. Water system cleaning has been discussed for these systems since that time but very little activity in this respect has been completed. For this project, some water main flushing was conducted by one of the three systems. The monitoring of this system in this project gives feedback on the status of water quality seven years after the major changes made in 2008.

Water System B was originally a groundwater system from 1886 to 1957. By 1957, a transmission line had been built to bring Lake Michigan water to a central treatment facility. Ozone as a primary disinfectant was added to the treatment train in 2000. A second transmission line from Lake Michigan to the treatment plant was added in 2005.

The water system exceeded the lead Action Level of 15 μg/L in 2011. An investigation was performed in 2013 that focused on the causes of the lead increase and recommended methods to control and monitor the lead and associated water quality parameters in the water system.

It was found that the prevalence of lead water service lines connected to privately-owned galvanized iron water service lines and other galvanized iron premise plumbing was a significant factor related to elevated lead at consumers' taps. The adsorption and accumulation of lead on galvanized iron pipe scales with eventual crumbling of the lead-laden scale into the water has been acknowledged in the technical literature as a major form of lead transport in premise plumbing (McFadden et al. 2011). Plans are being made for lead and galvanized iron service line removal.

A second factor affecting lead release in the system was the contribution of iron and manganese from past use of wells and from unlined cast iron water main to scale formation on lead service lines. An analysis of lead service line scales found crumbly scales of iron, manganese, and lead. Only standard hydrant flushing had been performed over the years to clean water mains; the pipe wall chemical analyses showed that this cleaning activity was not sufficient to remove system debris deposited decades ago when groundwater was used. During this project, an engineered uni-directional (high velocity) flushing program was designed and carried out for this water system.

A third factor in lead release found in the water system was a microbiological component. There were reported indications that microbiological activity increased in the distribution system just after the ozone process was placed online in 2000 with an increase in corroded valves and meters. The installation of the new transmission line in 2005 also appeared to coincide with increased lead and copper release. Additional water system modifications were made in 2010. Exceeding the lead Action Limit occurred in 2011. This will be discussed further in Chapter 6 and later.

Water System C treats Lake Michigan water using two separate processes. The first treatment plant is conventional filtration and was put on-line in 1963. In 1999, a microfiltration plant was placed into service. The distribution system receives a mix of water from the two plants.

This water system was studied using a special distribution system monitoring station (described in Chapter 5) at a high water age location in the distribution system in 2011 and 2012.

Even though this water system has never been out of compliance with the Lead and Copper Rule, when the system is routinely tracked with a monitoring station, it is seen that high and erratic releases of particulate lead occur in the test chambers. High velocity, uni-directional flushing of water mains was discussed as a remedy for this water quality behavior. However, resources have not been available for this purpose.

This water system also has the potential to produce biofilms and corrode metals when conditions are right. This was a significant finding in the past test chamber data. There was a complaint from an industry in 2012 with this problem. The problem was also observed in a water utility building in 2015.

A 60/40 poly/orthophosphate product has been added since 1996 to this water system in a low orthophosphate dosage. A chemical analysis of a lead service line in 2012 showed that no pyromorphite, the lead phosphate compound that is intended to protect the lead pipe walls, existed in the pipe wall scales. Instead, aluminum predominated in the scale with the source being the Lake Michigan water and the alum coagulant used at the conventional treatment plant. The aluminum compounds sorb existing lead compounds in the scale and are poised to both transport particulate lead upon scale disruption and to release dissolved lead into the water when environmental conditions, such as pH, re-solubilizes the aluminum compounds.

Water System I is a large system using Lake Michigan water since 1872. The first filtration plant was built in 1939. A second treatment plant was built in 1962. In 1996, orthophosphate as phosphoric acid was added for corrosion control. In 1998, ozonation was added for primary disinfection. Ozonation can break apart naturally-occurring organic carbon compounds into compounds more accessible for microbiological growth (Escobar and Randall 2001). Chlorination before the filters at both plants was discontinued at some point after the ozone was installed in order to create biological filters for better dissolved organic carbon removal.

Water System J is a smaller system using Lake Michigan water. The treatment plant was added in 1973. A 60/40 poly/orthophosphate product is used for corrosion control.

Municipal Groundwater Systems

Water System D began operation in 1914. In 1986, an area just across an adjacent river was annexed to the city and the water systems, each with 3 wells, were connected together in 1991. Early on, a unique iron and manganese removal plant was installed for the wells on the original city property. The system was called a Vyredox system where water was aerated as it was pumped from the ground and reinjected into the ground to use the aquifer as a filtration medium for the oxidized iron and manganese. The system also depended on naturally-occurring iron bacteria in the aquifer to help with the removal of dissolved iron and manganese from the water. The result was greatly lowered capacity of wells as the aquifer clogged with oxidized iron and manganese and bacterial growth. The water ultimately pumped from the wells after years of using this system had very high iron and manganese concentrations and was loaded with microorganisms and nutrients, especially organic carbon. An ozone oxidation and pressure filtration system replaced the Vyredox system in 1995. However, the removal efficiency for iron and manganese was low due to the high levels entering the plant. There were several other issues with the finished water. Over the years, there were episodes of being out of compliance with the Lead and Copper Rule resulting in the introduction of a poly/orthophosphate blend product and there were discolored water complaints from consumers. In 2006, the wells on the annexed city area were found to have high manganese concentrations, so a 100% polyphosphate product was added to that water in order to sequester manganese. The types of water are mixed in the distribution system to varying degrees. An investigation into the water quality issues began in 2012. The wells were investigated and rehabilitated as much as possible which lowered the iron and manganese concentrations entering the treatment plant. The treatment plant was renovated from 2014 to 2016, replacing ozone with chlorine oxidation and pH adjustment with a calcite contactor. After pressure filtration for oxidized iron and manganese removal, the water flows to a granular activated carbon contactor for dissolved organic carbon removal. Water mains have undergone high velocity flushing in 2016. This project was used as an opportunity to monitor as the water system was cleaned.

Water System K was founded in 1893. Over the years, a number of well fields were developed. In 1986, two of the wells had high iron. A polyphosphate was added to sequester the iron. In 1992, a radon and hydrogen sulfide removal plant was added using air stripping and an iron and manganese removal plant was added using oxidation and pressure filtration on a combined flow from the wells. This replaced the use of polyphosphate chemical addition. Originally, pH was adjusted above 8 because the utility was advised to do so for corrosion control.

For wells grouped at two other distribution system entry points, aeration was added for hydrogen sulfide and radon removal.

In 2005, the water system was found to be out of compliance for lead. An investigation was performed and found that the lead was being carried to the consumers in particulate form by means of manganese particulates in the water. In addition, there were indications in the investigation that there was a microbiological aspect to the system corrosion and that a high pH would render the free chlorine disinfection less effective. Upon recommendations from the investigation, the pH was no longer elevated by caustic soda addition. A uni-directional high velocity flushing program was initiated for water mains. Lead and Copper Rule compliance sampling performed in 2008 found the water system back in compliance. Continued high velocity flushing during warm weather periods has brought the lead concentrations even lower. Lead and Copper Rule compliance sampling in 2016 exhibited a very low 90^{th} percentile lead concentration (5.5 μg/L).

Copper concentrations are below the copper Action Level of the Lead and Copper Rule but are desired to be lower for wastewater treatment plant discharge considerations. Studies using a special distribution system monitoring station (described in Chapter 5) have identified possible influences for increasing copper release in the water system to be high chloride levels, possibly from road salt infiltration into the wells, and microbiologically influenced corrosion.

Water System L is a groundwater system with no lead service lines. In 2008 to 2011, a water quality investigation and studies using a special distribution system monitoring station (described in Chapter 5) recommended high velocity flushing of water mains. This was carried out. It was also recommended that one problematic well with high iron and high microbiological populations be rehabilitated and possibly an iron removal plant be built. This is in process in 2016. The use of a 70/30 poly/orthophosphate blend was found to not be as effective at lowering copper levels in an off-line re-configured monitoring station test against an orthophosphate product where 100% of the phosphorus was orthophosphate. It was recommended that the phosphate chemical be switched to an orthophosphate product. Then, with the distribution system monitoring station installed for routine tracking, bring the phosphate levels down slowly to an optimum level or determine if the dosage could be eliminated altogether. In 2012, before this slow approach could occur, a third party abruptly stopped the phosphate feed and it has stayed off.

It was also found in the studies that high chloride and microbiologically influenced corrosion appear to play a role in elevating copper concentrations similar to Water System K. High nitrates have been found in area wells and are increasing in the Water System L municipal wells;

nitrates could also be causing the higher release of copper. The 90th percentile copper concentration remains below but close to the Action Level.

Campus Groundwater Systems

Water System E is a campus water system where the owner also owns all the buildings served by the water system. These are large buildings with complex plumbing systems. Originally, the water source was an adjacent lake with a water treatment plant built in 1969. In 2005, wells were drilled and a connection of piping from the new well house to the existing water main was made even though the wells were not yet contributing water to the system. In 2006, the new wells and iron removal plant were placed in service. During this transition period, the surface water plant produced water in the morning to fill the elevated tank and sent treated groundwater to the tank in the afternoon. A dramatic increase in pinhole leaks in copper pipes inside buildings was experienced. An investigation found inadequacies with the new filter's ability to remove iron and manganese before it entered the distribution system. The investigation also found high populations of microorganisms especially in locations that leaks had occurred. It was recommended to perform water main and building plumbing flushing, not to allow water to stagnate in piping, and to keep a good disinfection barrier. There was also concern about the mixing of the two types of water with fluctuating characteristics that could disturb existing pipe wall scales. Labor and budget shortages prevented recommendations from being carried out. By 2012, the pinhole leak issue was worse and a new investigation began. After the second investigation, the filter was rehabilitated and began to keep iron and manganese out of the distribution system. An added granular activated carbon cap also removed dissolved organic carbon, a nutrient for microorganisms. Disinfection was kept at an appropriate level. A low dosage of a biofilm-cleaning chemical, Clearitas®, was dosed into the system water. Clearitas has a similar chemical composition as sodium hypochlorite but different chemical structure and properties. The chemical can break apart biofilm material on pipe walls. It was necessary to use this chemical as chlorine disinfection was apparently not sufficient to remove biofilms which were found inside pipes throughout the campus.

A special distribution system monitoring station (described in Chapter 5) was installed in this project to gauge the progress of the system cleaning. A routine of building main flushing, hot water tank blowdown, and softener cleaning was also put in place. Water mains, which are in a simple configuration, are also cleaned with a high velocity flush once or twice a summer, but do not appear to have a large quantity of debris accumulated.

Water System F first opened as a school in 1962 and had one well. In 1975, the campus was modified to accommodate a larger population. In 1983, a second well was drilled. By 1994, one well had been taken out of service and another one drilled. In 2006, another well and a 200,000-gallon reservoir were added to the water system. After that, pinhole leaks began to develop and hot water heaters also failed at a higher rate. By 2011, the two newer wells served the campus. The number of pinhole leaks increased. A water quality investigation found a high degree of microbiological activity. At the time of the investigation, construction was finishing on a new building. The new building was included in the investigation and it was found that the new plumbing system had already developed a biofilm problem and a few pipes had already developed pinhole leaks.

As recommended in the investigative report, the wells were inspected and rehabilitated. The well investigation concluded that the poor-quality water was coming from one of the wells where bacteria and fungi were found. Features in the borehole showed that poor quality water was short-circuited from surface influences to the lower portion of the well. Karst geology, that is, fissures in limestone rock, was suspected as the problem. The lower portion of this well was filled in and abandoned. Both wells were cleaned. Other cleaning activities included initiation of a low dosage of the biofilm-removing chemical, Clearitas®, into the system water, installation of new water mains, cleaning of the reservoir, and routine building plumbing maintenance as described for Water System E.

Water System G is a campus system that began with two wells in the 1960's. Well 3 was drilled in 1997 and Well 4 was drilled in 2007. The Action Level for copper was first exceeded in 2008; the Action Level for lead was first exceeded in 2012. A water quality investigation began in 2013 and a large presence of microbiological activity was found. The problem was found to initiate in the wells, so the wells were rehabilitated in 2013. Similar to Water Systems E and F, cleaning activities besides well rehabilitation included initiation of a low dosage of biofilm-removing chemical into the system water, high velocity flushing of water mains, cleaning of a reservoir, and routine building plumbing maintenance.

Water System H is a water system that serves two campuses of large buildings. Well 1 pumps directly to the distribution system and runs from 3 pm to 11 pm as called by the water tower level. Well 2 pumps to a reservoir where water is boosted directly to the distribution system. The water system was out of compliance with the Lead and Copper Rule for lead in 2011. A water investigation was performed. Similar to the other three campus systems, it was found that water quality problems in this system come from poor water quality in the wells. Cleaning activities included initiation of a low dosage of biofilm-removing chemical into the system water, high velocity flushing of water mains, and routine building plumbing maintenance. Well rehabilitation is occurring in 2017.

WATER SYSTEM CONFIGURATIONS

All water systems studied in this project are located in Wisconsin where utility data are collected on many aspects of operation for regulatory control. The data have been made available to the public and easily accessible by means of the Internet or by regulatory personnel.

The Wisconsin Department of Natural Resources (WDNR) stores and makes available data which describe the water system for each utility – the water sources, water treatment chemicals added, water treatment processes, the locations where the water enters the distribution system, and water storage in the distribution system.

This information is repeated in more detail in the Wisconsin Public Service Commission (WPSC) annual reports that each utility must submit. The WPSC oversees the setting of water rates and requests annual financial reports from the municipal water utilities. In addition, they request various descriptions and operational data in order to determine if water rates are fairly set. As side-benefits of this effort, the water system data in WPSC reports have become important for utility planning, engineering designs of system components, setting goals for efficient system operation, and quickly understanding the general features of a water system. This project uses the data to understand the general features of each water system and compare them. The following information is presented in this report using data from 2015:

- Population served
- Number of customers
- Water audit
    - Total pumpage

    - Wholesale customer sales
    - Retail customer sales
    - Water used for flushing, fire protection, and pipe freezing protection
    - Piping breakage loss
    - Leakage and other unaccounted-for loss (Total pumpage – sales and estimated known losses listed above)
    - % Unaccounted-for water loss (Leakage and other unaccounted-for loss/Total pumpage)
- Water sources
    - Main
    - Emergency
- Entry points to the distribution system
    - Main
    - Emergency
- Water treatment processes and chemicals
    - Treatment plant identification
    - Intake chemicals, if relevant for surface water plants
    - Primary disinfection methods, if relevant for surface water plants
    - Water treatment processes
    - Water treatment chemicals used in the processes
    - Secondary disinfection methods
    - Corrosion control chemicals
    - Other chemicals
- Water stored in the system
    - Volume of water stored in standpipes, reservoirs, and elevated tanks
    - Number of storage facilities (not stated in this project)
- Water main inventory
    - Type of material
    - Diameter of pipes by material (not stated in this project)
    - Length of pipes by material in feet
- Water service line inventory
    - Type of material
    - Diameter of pipes by material (not stated in this project)
    - Number of service lines by material

Information, as described above, regarding four of the water systems (Systems E, F, G, and H) studied could not be obtained from WPSC because they are not typical municipal water systems and do not set water rates. The four systems are campuses where the water system and all buildings have the same owner.

Water pumpage data for the four campus-type water systems were obtained from WDNR monthly operations data. Water utilities complete daily water pumpage and chemical use forms that are submitted to WDNR monthly characterizing the water treatment facilities operations.

Tables 2.3 to 2.12 list and compare the data for the participating water utilities.

Table 2.3
2015 utility size for project #4586 participants

Water System	Population Served	Number of Customers
A	35,149	11,765
B	105,000	35,742
C	109,000	30,266
I	864,653	161,104
J	18,400	5,509
D	4,230	1,797
K	19,451	7,886
L	18,199	6,768
E	1,600	1
F	1,500	1
G	1,700	1
H		2

Table 2.4
2015 pumpage in 1000 gallons for project #4586 participants

Water System	Groundwater	Surface Water	Purchased Water	Total Pumpage
A	0	1,285,923	0	1,285,923
B	1,054	6,496,991	0	6,498,045
C	0	4,614,951	0	4,614,951
I	0	35,872,390	0	35,872,390
J	239,978 to industry	796,226	0	1,036,204
D	164,531	0	0	164,531
K	757,767	0	0	757,767
L	719,032	0	0	719,032
E	47,786	0	0	47,786
F	61,480	0	0	61,480
G	42,504	0	0	42,504
H	77,878	0	0	77,878

Table 2.5
2015 percent unaccounted-for water loss for project #4586 participants

Water System	% Unaccounted-for Water Loss
A	2.4
B	6.4
C	7.7
I	15.9
J	11.6
D	11.3
K	15.8
L	2.5
E	no data
F	no data
G	no data
H	no data

Note: Regarding unaccounted-for water loss, other benchmarks for non-revenue water are available and should be explored in characterizing a water system (Sayers et al. 2016).

Table 2.6
Water sources for project #4586 participants

Water System	Main Water Source	Backup Water Source
A	Lake Michigan	Lake Michigan
B	Lake Michigan	9 wells
C	Lake Michigan	Lake Michigan
I	Lake Michigan	Lake Michigan
J	Lake Michigan	Lake Michigan
D	6 well	wells
K	15 wells	wells
L	5 wells	wells
E	2 wells	wells
F	2 wells	wells
G	4 wells	wells
H	2 wells	wells

Table 2.7
Lead service lines for project #4586 participants

Water System	Number of Lead Service Lines	% of Total Service Lines That are Lead
A	3,126	26
B	2,252	6
C	8,907	30
I	77,000	48
J	1,236	23
D	107	6
K	76	1
L	0	0
E	0	0
F	0	0
G	0	0
H	0	0

Table 2.8
Water treatment for Water Systems A, B, and C

Plant Name	Intake Chemicals	Primary Disinfection	Treatment	Treatment Chemicals	Secondary Disinfection	Corrosion Control Chemicals	Other Chemicals
Water System A: Central Treatment Facility	Polymer for mussel control. Was previously sodium hypochlorite and then potassium permanganate.		Flocculation, sedimentation, rapid sand filtration	alum, polymer, optional powdered activated carbon	UV, chloramine	LPC-132: 10/90 poly/ortho blend	Fluoride
Water System B: Central Treatment Facility	Chlorine Gas	Ozone	Flocculation, Sedimentation, Sand Filtration	HyperIon 1050A, a polyaluminum hydroxychloride as coagulant, Carbon Dioxide, Sodium Bisulfite	Sodium hypochlorite	None	Fluoride
Water System C: East Filter			Flocculation, Sedimentation, Rapid Sand Filtration	Alum	Gas Chlorine	Carus 8400: 60/40 poly/ortho blend	Fluoride, potassium permanganate if needed for taste and odor
Water System C: Microfiltration			Membrane Filtration		Gas Chlorine	Carus 8400: 60/40 poly/ortho blend	Fluoride

Table 2.9
Water treatment for Water Systems I and J

Plant Name	Intake Chemicals	Primary Disinfection	Treatment	Treatment Chemicals	Secondary Disinfection	Corrosion Control Chemicals	Other Chemicals
Water System I: Plant 1		Ozone	Flocculation, sedimentation, rapid sand filtration, anthracite filtration	Coagulant	Chloramine	Phosphoric acid	Fluoride
Water System I: Plant 2		Ozone	Flocculation, sedimentation, rapid sand filtration, anthracite filtration	Coagulant	Chloramine	Phosphoric acid	Fluoride
Water System J: Treatment Plant		Gas Chlorine	Flocculation, Sedimentation, Rapid Sand Filtration, Activated Carbon Filtration	Coagulant	UV, Gas Chlorine	Aquadene SK7641: 60/40 poly/ortho blend	Fluoride

Table 2.10
Water treatment for Water System D

Plant Name	Intake Chemicals	Primary Disinfection	Treatment	Treatment Chemicals	Secondary Disinfection	Corrosion Control Chemicals	Other Chemicals
Water System D: Central Facilities			pH adjustment with calcite, oxidation, iron and manganese removal, granular activated carbon	liquid chlorine	liquid chlorine	Aquadene SK7543: 80/20 poly/ortho phosphate	
Water System D: 3 Individual wells directly to system					liquid chlorine	Aquadene SK7699: 100/0 poly/ortho phosphate	

Table 2.11
Water treatment for Water Systems K and L

Plant Name	Intake Chemicals	Primary Disinfection	Treatment	Treatment Chemicals	Secondary Disinfection	Corrosion Control Chemicals	Other Chemicals
Water System K: Central Treatment		Sodium hypochlorite	Aeration, Iron/manganese removal	potassium permanganate, polymer	Liquid chlorine	None	Fluoride
Water System K: Booster Station #1			Aeration		Liquid chlorine	None	Fluoride
Water System K: Booster Station #2			Aeration		Liquid chlorine	None	Fluoride
Water System L: EP1					Gas Chlorine	None (used to use 50/50 poly/ortho blend)	Fluoride
Water System L: EP2					Gas Chlorine	None (used to use 50/50 poly/ortho blend)	Fluoride
Water System L: EP3					Gas Chlorine	None (used to use 50/50 poly/ortho blend)	Fluoride
Water System L: EP4					Gas Chlorine	None (used to use 50/50 poly/ortho blend)	Fluoride

Table 2.12
Water treatment for Water Systems E, F, G, and H

Plant Name	Intake Chemicals	Primary Disinfection	Treatment	Treatment Chemicals	Secondary Disinfection	Corrosion Control Chemicals	Other Chemicals
Water System E: Central Facilities			Iron and manganese filtration with granular activated carbon cap	Sodium permanganate	Sodium hypochlorite	None	Clearitas
Water System F: individual wells					Sodium hypochlorite	None	Clearitas
Water System G: individual wells					Sodium hypochlorite	LPC-AM: 70/30 poly/ortho blend	Clearitas
Water System H: individual wells					Sodium hypochlorite	AquaMag: 70/30 poly/ortho blend	Clearitas, Fluoride

LEAD AND COPPER RULE COMPLIANCE DATA

To add more insight into the history of each water system, Lead and Copper Rule compliance data can be very informative. Changes in 90th percentile lead and copper concentrations over time can pinpoint a time period to study for possible operational changes that affected the water quality. Other statistics derived from Lead and Copper Rule sampling period data can also indicate positive or negative water quality trends.

Figure 2.1 is an example of a historical utility plot of copper concentration data statistics for each Lead and Copper Rule monitoring period since 1991 when the Rule was initiated. The Rule can require two monitoring periods a year: 1 – January through June and 2 – July through December. When a water system is deemed in compliance with the Rule, monitoring is required once every three years in the warmer semester, monitoring period 2. If out of compliance, a water system must demonstrate a 90th percentile lead or copper concentration less than the published Action Level (15 µg/L for lead and 1300 µg/L for copper) for two semesters in a row and again in a semester a year later. The Action Level is shown on the plot as a dotted line. In addition, the statistics for each monitoring period dataset are shown.

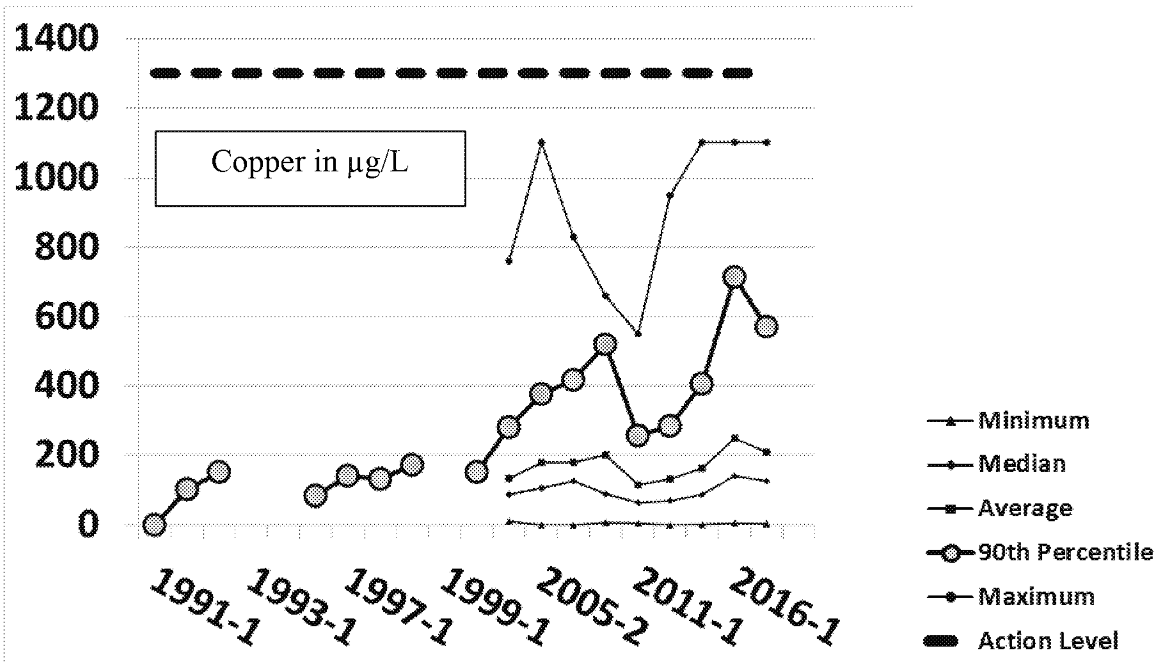


Figure 2.1 Example of plot of historical utility Lead and Copper Rule data

In Figure 2.1, the water utility never went out of compliance for copper. However, an upward trend of copper occurred starting in 2002 through 2016 with a sudden drop in 2011. While this was not a regulatory issue, it was an operational one signaling a slow degradation of water quality. A study of operational changes between 1999 and 2002 when the trend began was warranted.

Lead and Copper Rule compliance sampling data were obtained for each utility starting from the Rule's initiation in 1991 through the end of this project in 2016. The WDNR collects data on water quality as prescribed by Federal and State drinking water regulations in order to assess utility compliance with the various regulations. The data are stored electronically and the WDNR website allows public access to downloading data in spreadsheet form. Until 2000, the

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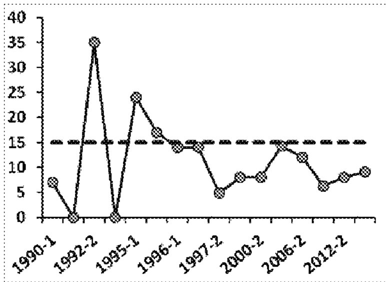
WDNR only stored the 90th percentile value for lead and for copper for each compliance monitoring period. This is the value that determines utility compliance with the Lead and Copper Rule. Ninety percent of the data collected in a monitoring period are lower than this value. Two different sets of data can have the same average but one dataset may have higher values; the 90th percentile method identifies those utilities that have the potential to produce the higher concentrations of lead and copper in the drinking water.

After 2000, the WDNR began to post all data in each compliance monitoring period and not just the 90th percentile value. With those datasets, other statistics have been calculated such as the minimum, average (mean), median (50th percentile), 90th percentile, and maximum values. These statistics are also plotted for each utility as shown in Figure 2.1.

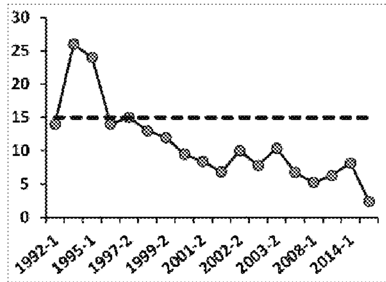
Figures 2.2 to 2.7 show and describe the history of each water system's compliance with the Lead and Copper Rule for lead and for copper. For these graphs, the 90th percentile concentration history is shown in relation to the Action Level.

Water System A



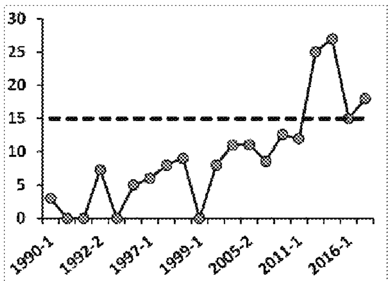
- -1992 above Action Level
- -1995 above Action Level
- -1997 in compliance; 50/50 poly/orthophosphate added
- -2003,6 close to Action Level
- -2008 change to orthophosphate and chloramine
- -2009 further drop in 90th percentile

Water System I



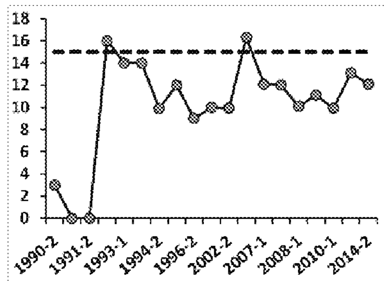
- -Above Action Level at first
- -Adds 1.9 mg/L as PO4 of 100% orthophosphate
- -Has not been above Action Level since 1997

Water System B



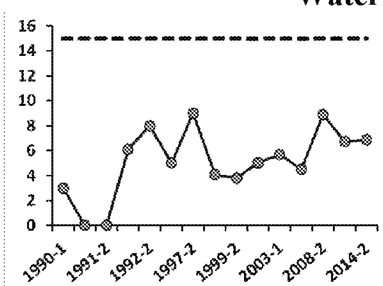
- -2000 Ozonation added; lead increase begins
- -2005 Large transmission line added
- -2011 Begin above Action Level with accelerated increase
- -2016 Cleaning brings lead down but biostability issue not yet resolved

Water System J



- -Above Action Level in 1992 and 2005
- -Adds 60/40 poly/orthophosphate blend
- -Hovers just below Action Level

Water System C



- -Never above Action Level
- -Adds a low dose of 60/40 poly/orthophosphate blend

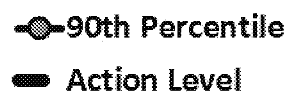
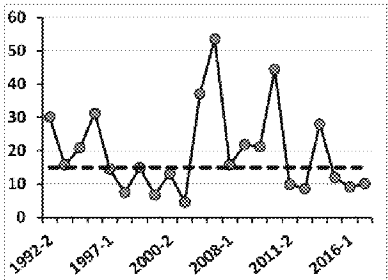


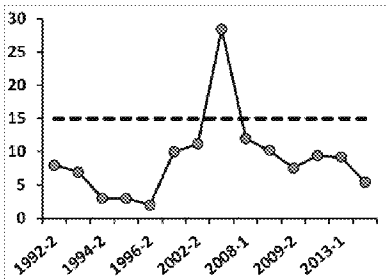
Figure 2.2 Lead and Copper Rule compliance data for lead in µg/L for municipal Lake Michigan water systems

Water System D



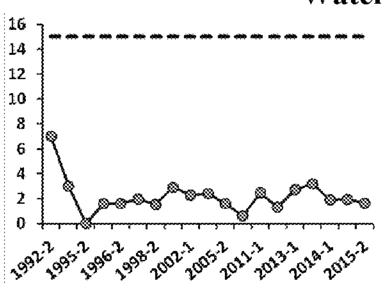
-Over Action Level several times, the latest in 2012
-2016 below Action Level after extensive cleaning and treatment modifications; these are not yet completed

Water System K



-Over Action Level in 2005; investigation in 2006
-Extensive uni-directional flushing in 2007
-Under Action Level in 2008
-In 2016, 90th percentile is 5.5 μg/L with flushing only

Water System L



-Never above Action Level

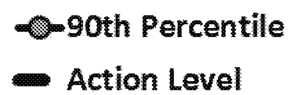


Figure 2.3 Lead and Copper Rule compliance data for lead in μg/L for municipal groundwater systems

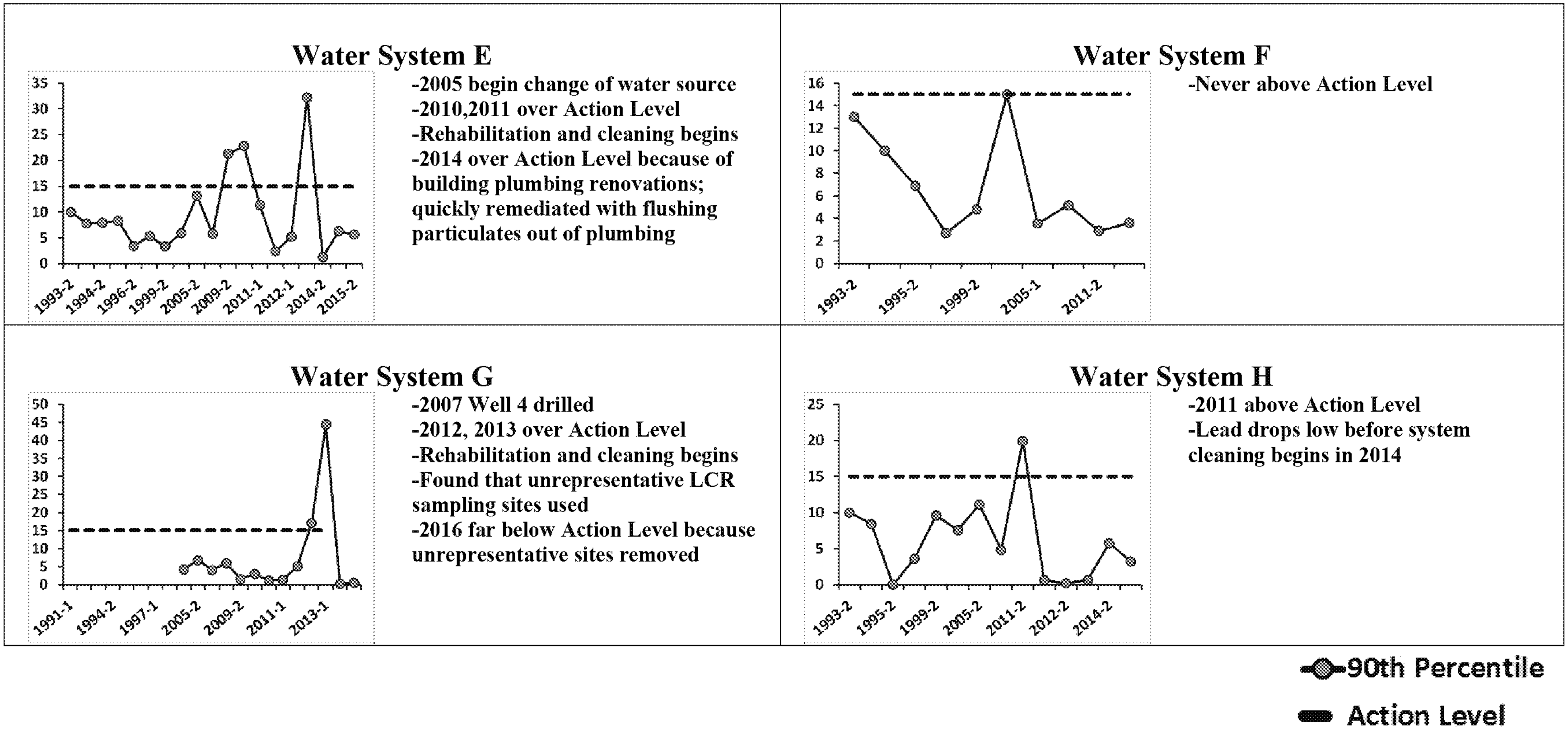


Figure 2.4 Lead and Copper Rule compliance data for lead in µg/L for campus water systems

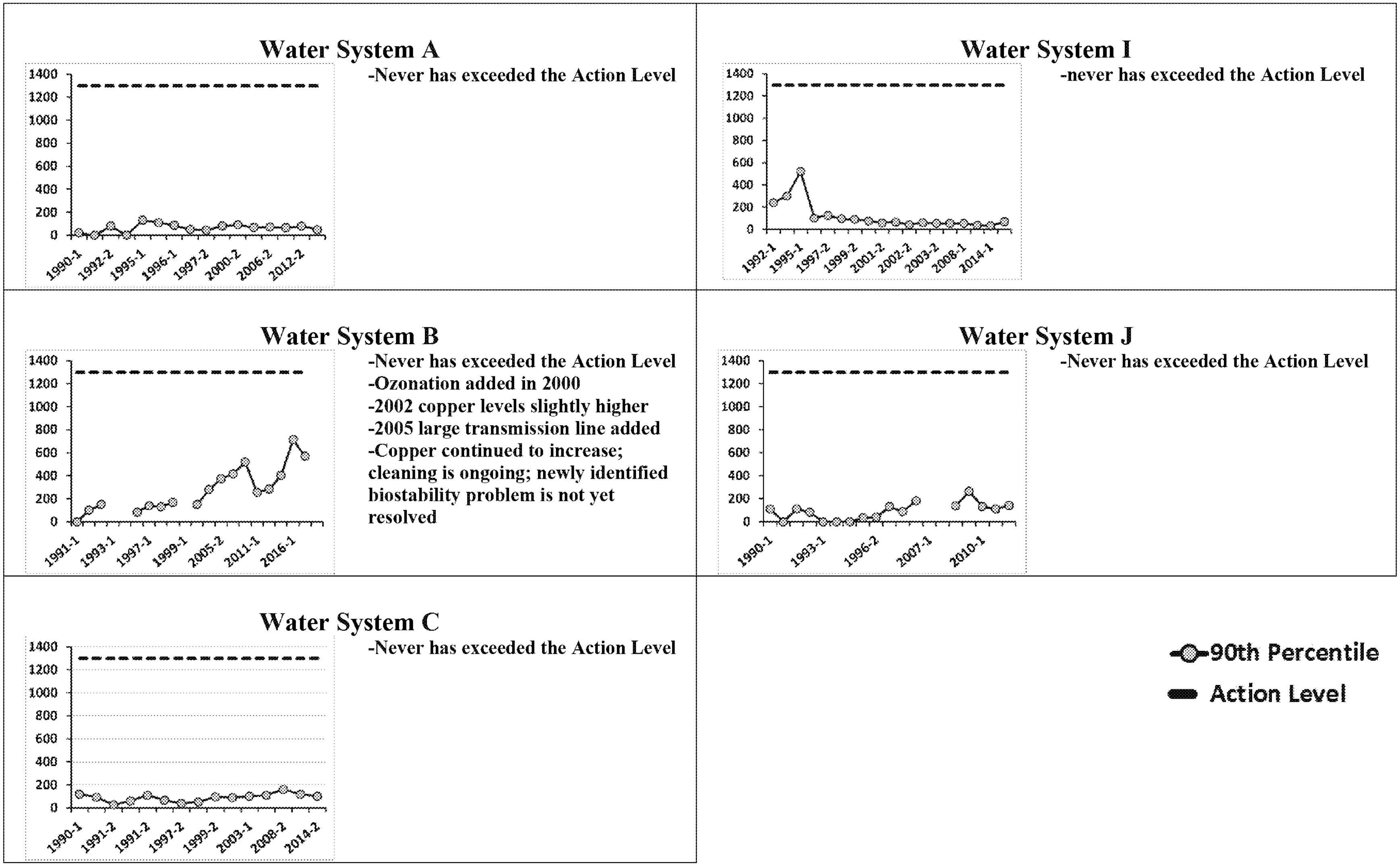
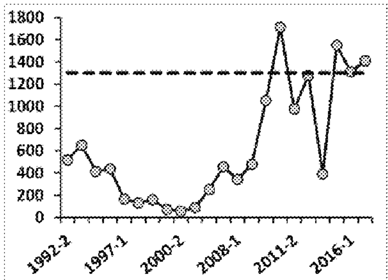


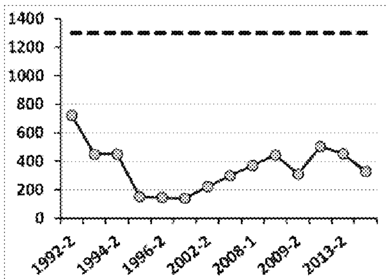
Figure 2.5 Lead and Copper Rule compliance data for copper in μg/L for municipal Lake Michigan water systems

Water System D



-Has exceeded or been close to exceeding Action Level several times
-Extensive cleaning ongoing
-2015,2016 above Action Level
-Cleaning continues; polyphosphate being removed from corrosion control product

Water System K



-Never has exceeded the Action Level

Water System L

-There was erroneous data on the public website for this system so no graph is shown. Water System L has a 90th percentile copper concentration that is below but close to the Action Level of 1300 µg/L.

-○-90th Percentile
▬ Action Level

Figure 2.6 Lead and Copper Rule compliance data for copper in µg/L for municipal groundwater systems

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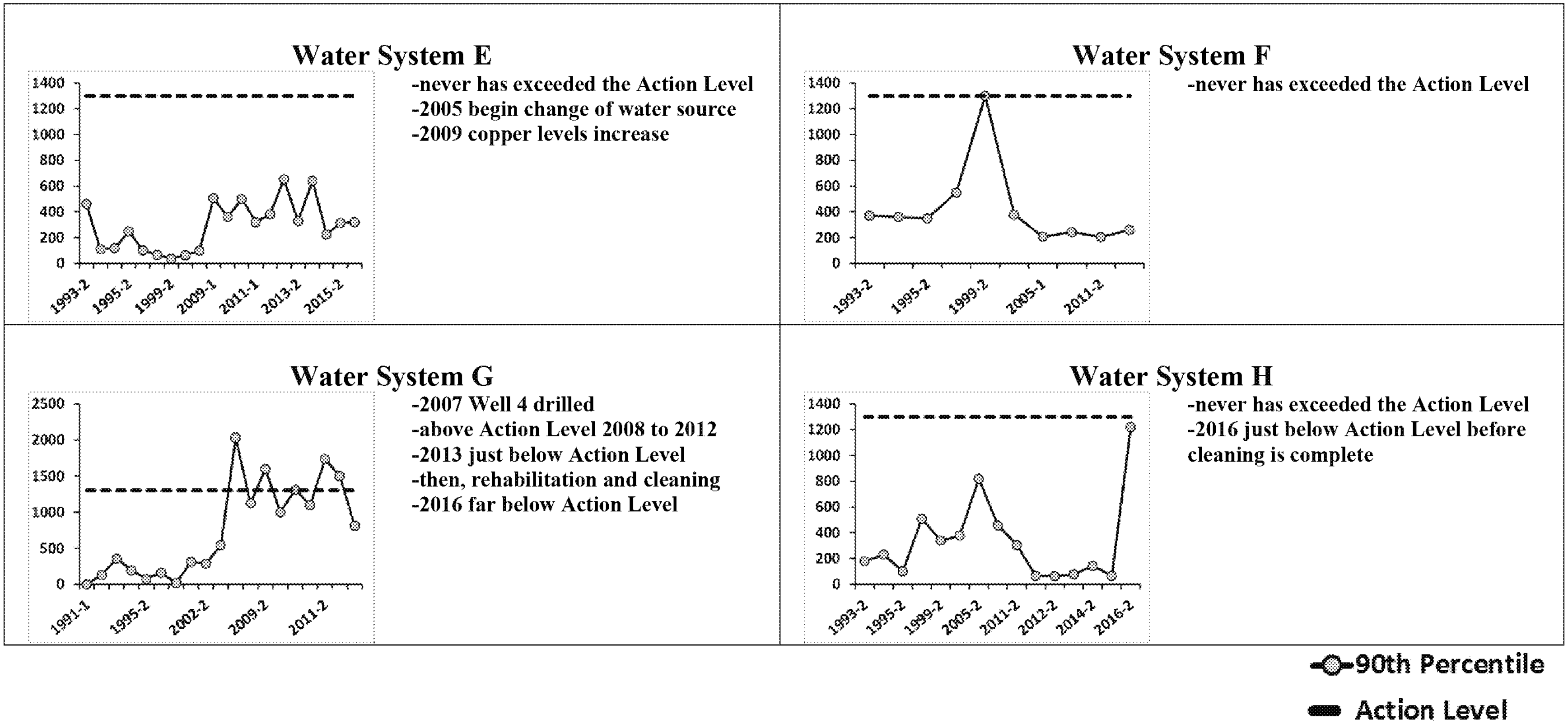


Figure 2.7 Lead and Copper Rule compliance data for copper in µg/L for campus water systems

WATER SYSTEM TIMELINES

To summarize the history of each water utility, timelines were constructed incorporating Lead and Copper Rule data trends, operational and regulatory information, and summary information from engineering reports. Timelines are very important for theorizing why water quality changes may have occurred.

A timeline was constructed for each water utility in varying detail. Much of the historical information was obtained from the WPSC annual reports where water system construction and maintenance activities are reported to justify expenditures. Other information, such as treatment chemical changes, was obtained from utility personnel, previous engineering reports, and WDNR operational data.

A utility timeline is less detailed for older events, such as noting major construction or operational changes. As a timeline becomes more current, more details are added – chemical product changes, chemical dosage changes, major or systemic customer complaint events, regulatory compliance issues.

Tables 2.13 to 2.24 list, over several pages, the timelines for each utility. The timelines become very important in explaining unique changes in time-based data as in interpreting changes on the Lead and Copper Rule compliance data graphs or in interpreting any ongoing system monitoring data.

SUMMARY

Key aspects of the participating water systems have been described in this chapter. It is important to understand the general configuration of a water system in order to study its water quality. Water source, treatment processes, chemicals used, system storage, and materials of construction all can influence the water quality that the consumers receive.

Lead and Copper Rule compliance data, taken every six months to every three years over time since 1991 can serve to pinpoint periods in time where operational changes may have affected lead or copper release trends and possibly additional distribution system water quality changes.

Finally, it is informative to compile a timeline of events at a water utility, listing configuration changes, operational changes, compliance issues, and major customer complaints. Using the timeline, the reason for water quality changes in certain time periods may be illuminated.

For the water utilities participating in this project, the story of their water quality begins here.

Table 2.13
Water System A timeline

Date Range	Event
1961	Plant built
2000	Adding poly/ortho phosphate blend for corrosion control
4/2008 - 9/2008	Offline chemical comparison study of phosphate products using PRS Monitoring Station
4/2008 - 9/2008	PRS Monitoring Station study of original water system where free chlorine disinfection and 50/50 poly/orthophosphate chemical were used
9/2008 - 11/2008	PRS Monitoring Station study of change to 10/90 poly/orthophosphate while still using free chlorine (see previous offline tests)
11/2008-4/2009	PRS Monitoring Station study of change to chloramine disinfection
11/2009	PRS Monitoring Station study of steady states of water system after big changes and use for process control
5/2010	Lowered phosphate dosage slightly
7/2010	Begin raising dosage back up to original dosage

Table 2.14
Water System B timeline

Date Range	Event
1886 to 1957	Well water system
1955	Raw water transmission line from lake to filter plant built
1956	Intake 1 built
1957	Raw water pumping station and conventional filtration plant are operational. Lake Michigan now used as the water source.
1972	Various treatment changes made by this year: fluoride changed from powder to liquid hydroflurosilicic acid; potassium permanganate had been used at raw water pumping station but was changed to chlorine; chlorine dioxide and ammonia was used for brief periods at the filter plant but is now free chlorine disinfection.
1990	Finished water free chlorine residual increased from 0.40 ppm to 0.55 – 0.60 ppm
1991	Switched from alum to polyaluminum hydroxychloride (Hyperion 1050A) as coagulant
1992	Powdered activated carbon feed stopped.
2000	Ozone on-line; begin to have trouble with copper pressure reducing valve components; now all are replaced with stainless steel
2005	2nd transmission line from lake to plant was built and in operation by June; treatment plant capacity was increased; a sodium hypochlorite system was installed to replace the use of gaseous chlorine
2006	Switched from chlorine gas to sodium hypochlorite
2007	Finished water free chlorine residual increased from 0.6 ppm to 0.70 – 0.75 ppm
2008	March: A carbon dioxide injection system was installed in the sodium hypochlorite carrier water to prevent scaling in the solution delivery line
2010	Variable frequency drives installed at lake water pumping station
2011	A section of one transmission line was replaced late in the year
2011	Filtration reservoir leak investigation
2011	Distribution system modeling
2011	Fluoride residual lowered to 0.70 – 0.80 ppm
2012	Lead service line harvested and chemical scales studied
2012	Increase in service leaks; Begin engineering planning study
2013	Break in 36" main
2014	January, February: Severe winter weather causing increased main leaks
2014	January, February: Severe winter weather causing increased frozen services
2014	March: Monitoring station installed and monitoring begins
2014	Summer: First year of uni-directional flushing
2015	Summer: Second year of uni-directional flushing
2016	January: End of distribution system study

Table 2.15
Water System C timeline

Date Range	Event
1895	Municipal water utility formed
1917	First filtration plant constructed with upgrades in 1926,1932, and 1951 (West Plant)
1928	Utility began using copper pipe for water services
1929	Filtration plant expansion from 8 MGD to 14 MGD
1949	Emergency intake constructed in the harbor
1952	Filtration expansion to 20 MGD
1964	East Filtration Plant constructed
1976	New 48" Lake Michigan intake placed in service
1996	Begin poly/orthophosphate addition
1997	Replaced filter media in East Filter Plant
1999	Microfiltration system added
2001	West Plant abandoned
2002	Expanded microfiltration plant to increase capacity by 50%
2006	A 0.75-million-gallon elevated storage tank constructed
2011	Ran PRS Monitoring Station for a year
2014	extreme cold weather with high number of main breaks
2014	extreme cold weather with high number of frozen services

Table 2.16
Water System I timeline

Date Range	Event
1871	Utility formed
1872	First system constructed of water intake, pumping system, and distribution mains
1888	Second intake added
1895	Third intake added; the first two intakes abandoned
1910	Chlorination with calcium hypochlorite begun
1915	Chlorination changed to liquid chlorine/chlorine gas system
1918	Fourth intake added
1939	Water treatment plant started -- coagulation, sedimentation, filtration, disinfection
Around 1960	Ammonia added to disinfect with chloramines
1962	Second treatment plant constructed
1994	Sand filter renovations; anthracite added to the sand filters
1996	Addition of orthophosphate for corrosion control implemented
1998	Ozonation with hydrogen peroxide addition put on-line for primary disinfection
before or around 2000	Chlorination before the filters at both plants was stopped to create "biological filters" for removal of dissolved organic carbon
2014	Repair of mains because of harsh winter

Table 2.17
Water System J timeline

Date Range	Event
1954	Treatment Plant built - upflow clarifiers with rapid sand filters 3.0 MGD capacity
1963	Treatment Plant addition – clarifiers replaced by flocculation/sedimentation basin
1973	Treatment plant addition – filter capacity added, floc/sed capacity added plant capacity now 6.0 MGD
1990	Changed coagulant from alum to a PAC product Gen Chem 1050A
1992	PO4 added for corrosion control
1992	Exceeded action level for lead
1998	Raw Water Pumping Station upgraded – new pumps and control
1998	Raw Water Pumping Station upgraded – new pumps and control
2000	Alternated intakes and added Cl_2 once per year to intakes for mussel control stopped practice in 2010
2000	GAC Media added to filters chlorination point moves from pre-filter to post-filter
2004	UV Disinfection added to treatment
2005	Exceeded action level for lead
2010	Swift Ave transmission main extended to north end of city
2011	Replaced 2 filter effluent flow control valves
2014	Cold winter and high number of main breaks
2014	engineering planning study begun
2014	High number of frozen services

Table 2.18
Water System D timeline

Date Range	Event
1914	Waterworks begins operation
1986	the area east of the river annexed to the city
1991	The 2 water systems connected together
1995	A Vyredox system for iron and manganese control at Wells 3,4 and 5 was replaced with an ozone oxidation/pressure filtration system
6/1997	Lead and Copper levels found to be lower
Jan/Feb 2000	Filter media replaced
5/2004	Lead first exceeded the Lead and Copper Rule Action Level.
2005	Well 6 drilled near Wells 1 and 2
6/2006	Switched from Aquadene to AquaMag. "Dirty water" complaints increased.
2006	Manganese found to be elevated in Well 2; polyphosphate feed adjusted to sequester its manganese which addressed customer complaints of discolored water; Well 2 use is minimized by designating it as the lag pump to Wells 1 or 6 lead
Apr/May 2006	Filter media replaced
2008	Consent order to replace lead service lines
5/2008	Temporary drop in lead and copper levels
12/2009	Copper first exceeded for Lead and Copper Rule
2010	Powdered lime use was stopped and liquid calcium hydroxide use began at treatment plant
Jun 2010	Switched from AquaMag to Aquadene
	SK7643 (30% ortho/70% poly) fed at treatment plant
	SK7699 (100% poly) fed at other wells
Jan 2011	Filter media replaced
Aug 2011	Lead and copper levels dropped below Action Level
Feb 2013	Filter media replaced
2012	Water quality investigation
2012	Water main flushing of west side of city
2013	well repair; water treatment study
2013	Water main flushing of east side of city
1/2014 - 3/2014	Breaks and freeze ups of service lines and water mains
2014 to early 2016	Renovation of water treatment plant with optimization in 2016
2016	High velocity water main flushing

Table 2.19
Water System K timeline

Date Range	Event
1893	Utility established
1904	Water utility purchased by the city
1923-1946	2 well fields developed
1947	1 more developed
1949	Northeast well field developed; Well 16 completed
1950	Well 17 of Northeast well field completed
1964	Well 18 in Northeast completed.
1955	Well 11 stopped production; converted into Booster Pumping Station
1960	Well 1 abandoned
1961	storage added
1966	Well 1A constructed
1968	another well field developed and Wells 19 and 20 completed; reservoir added
1969	Well 9 abandoned
1986	High iron in Wells 19 and 20; stopped using wells for a while; then, polyphosphates added and well usage resumed
1990	another well field developed with Wells 21 and 22 constructed
1992	water treatment facility on-line treating well water from 4 well fields to remove iron, manganese, radon, hydrogen sulfide, and adjust pH
1996	Approximate time that polyphosphates no longer used at Well 1 pump house
1996	Iron bacteria were found in a water tower that was being cleaned. The chlorine level at the entry points to the distribution system was increased from 0.5 mg/L to 0.7 mg/L in order to counteract any biofilms found elsewhere in the system.
2000	Well 3 abandoned; Well 7 abandoned; Well 16 abandoned
2002	Well 2 abandoned; booster station #2 switch from gas to liquid chlorine
	booster station #1 refurbished: addition of aeration, removal of caustic soda, switch from gas to liquid chlorine
2003	Well 23 drilled; Water treatment facility switch from gas to liquid chlorine; Wells 13 and 15 abandoned
2005	Above Action Level for lead
2006	Water quality investigation with recommendation to lower pH and high velocity flush water mains
2006	Stopped increasing pH with sodium hydroxide for corrosion control; High velocity flushing of water mains
2007	Below Action Level for lead
2010	Well rehabilitation
2011	Well rehabilitation for 3 wells; June began Lead and copper study; New water tower completed
2011	Additional high velocity water main flushing (this is done almost every summer since 2006)
2011	Several major distribution mains replaced
2012	Well rehabilitation for 2 wells
2013	No flushing
2014	1 well rehabilitation; Construction of new well 26; No flushing
2014	Large number of service line freeze-ups due to cold weather; Record number of main breaks due to cold weather
2015	High velocity flushing of water mains; Well 26 online

Table 2.20
Water System L timeline

Date Range	Event
1971	Well 7 added
1978	Well 8 added
1987	Well 9 added
1998	Well 5 added
2007	Well 10 added
2012	discontinued phosphate
2014	well reconstruction

Table 2.21
Water System E timeline

Date Range	Event
1969	Surface water treatment of adjacent small lake
	Water aerated and pre-chlorinated
	Upflow clarifier with aluminum sulfate, lime, coagulant aid, and powdered activated carbon addition
	Recarbonation after clarifier to decrease pH to 9
	Post-chlorination
	Sand filtration
	Clearwell
3/2005	Connection of piping from a new well house to existing water main made
3/2006	New well and iron removal plant placed into operation
	Aeration, prechlorination, potassium permanganate addition of raw well water
	Filters of anthracite impregnated with manganese dioxide (later found that proper media never supplied)
	Sodium hydroxide to increase pH to match surface water
	In transition period, surface water in morning and groundwater in afternoon
	Both cast and ductile iron pipe water mains; No lead service lines
2006	Dramatic increase in pipe leaks; were some routinely before but greatly increased; Investigation with recommendations
2012	Investigation after more pinhole leaks

Table 2.22
Water System F timeline

Date Range	Event
1962	Opened as a school; had one well
1975	Modified to accommodate a larger population
1983	Well 2 drilled
1993	Well 1 had been taken out of service
1994	Well 3 drilled
1998	Water softeners installed to prevent scaling in hot water systems
2006	Well 4 constructed and placed online
2006	A 200,000-gallon reservoir added
After 2006	A high degree of plumbing equipment replacement reported, including copper piping and hot water heaters
2011	An increase in pinhole leaks in copper pipe
2011	Wells 3 and 4 serve the campus
2012	Health Services Unit building opened after a long construction period
	The building was found to have biofilms throughout the plumbing before occupancy with some pipe failure
2012	Water quality investigation of campus
4/2013	Investigation of wells
Winter 2014	Repair of Well 4 and rehab of Well 3

Table 2.23
Water System G timeline

Date Range	Event
1960 to 1970	Wells No. 1 and 2 drilled
1997	Well No. 3 drilled
2007	Well No. 4 drilled
2008	Exceeded Action Level for copper; phosphate dosing increased
2009	Re-sampling showed lower copper
2012	Exceeded Action Level for lead and copper
2013	Investigation performed on water system; plans made for cleaning and monitoring in water system
2013	Water system continued to be above Action Level for lead and copper
9/2013	Wells No. 3 and 4 out of service for partial rehabilitation
11/2013	Wells No. 3 and 4 back on-line with low quality water blocked
9/2014	Monitoring station installed in distribution system and monitoring/flushing plan put into action

Table 2.24
Water System H1 and H2 timeline

Date Range	Event
2011	Out of compliance with LCR

CHAPTER 3
RESIDENTIAL PROFILE SAMPLING

Five of the participating water utilities (Systems A, B, C, I, and J) – all Lake Michigan water systems - selected two residences each for profile sampling. Profile sampling is a technique of lead and copper release assessment where sequential liters of stagnating water are drawn from a building's plumbing system. Analysis of each liter sample can describe where lead or copper reach higher concentrations relative to other locations in the plumbing system. That location is related to piping material, giving insight into the piping materials and locations in an individual building where lead or copper can be problematic. Lead and copper concentrations found by this method quite often show that the first draw liter of water as prescribed to be taken for Lead and Copper Rule compliance does not necessarily represent the maximum lead or copper concentration that could potentially reach the water consumers in that building (Cornwell and Brown 2015).

The following sampling protocol was used in this project for profile sampling of residences:

- Select two houses with a lead service line
- Using a hardness test strip, confirm that the kitchen cold water tap is not softened.
- Estimate the volume of water from the kitchen tap through the lead service line and determine the number of liter bottles required from sample tap to water main. Add 2 more liter bottles to obtain water samples from within the water main.
- Run water at normal flow rate at the kitchen tap until cold before stagnation, say 5 minutes. This helps to ensure that all sampling taps in all buildings began the experiment with fresh water from the water main. "Normal" flow rate is like filling a glass of water; it is not a flushing velocity, nor is it a trickle of flow.
- If possible, take flowing water samples for the following analyses: lead, copper, calcium, magnesium, iron, manganese, zinc, aluminum, cadmium, nickel, chloride, sulfate, fluoride, total phosphorus, orthophosphate, potassium, silica, sodium, and total alkalinity. Use "normal" flow rate to capture the sample in laboratory sample bottles.
- Check for automatic water use, such as ice makers, softeners, and humidifiers, and turn off.
- Stagnate the water 6 hours minimum or overnight.
- Keep the faucet aerator on as is expected in Lead and Copper Rule sampling.
- Using "normal" flow rate, take samples to reach from tap through lead service line into water main in separate one liter bottles. WIDE MOUTH bottles are to be used so that water flow into sample bottles can be similar to filling a glass of water. There should be no acid in any sample bottle in case a lab filtration of a portion of the sample can be performed. With the filtration, separate dissolved and total metals concentrations can be captured before acid preservation of the sample dissolves all metals.
- After stagnation sampling, if flowing water samples have not been taken before stagnation, take them now.
- Turn on automatic water use appliances before leaving the house.
- Send all bottles to the laboratory for analysis. Stagnation samples are to be analyzed for lead, copper, iron, manganese, zinc, aluminum, cadmium, and nickel.

- Perform this sampling in March or April 2015 while water is still cold from winter and water main flushing has not begun (Systems A and B did this), September or October 2015 (water is warmer from summer temperatures and flushing is either occurring or finished) and then again in November or December 2015 (water temperature has cooled and flushing was finished several months previously).

A video demonstrating profile sampling is available from the Milwaukee Water Works to explain the profile sampling to home owners and utility personnel. The video can be viewed at: https://youtu.be/t1Rmf7dcms0.

Fall and early winter sampling in 2015 was funded by the EPA and samples were analyzed in their Chicago laboratory. Funding was procured by Miguel del Toral, Regulations Manager in Region 5 EPA's office in Chicago.

It was not possible to perform sample filtration to differentiate between dissolved and particulate lead. However, Systems A and B paid for extra profile sampling before September 2015 and used a commercial laboratory. In those cases, lead was differentiated into dissolved and particulate fractions using laboratory filtration of a portion of each sample. The filtered sample portions were analyzed for dissolved lead and copper and the unfiltered sample portions were analyzed for total lead and copper. Particulate lead and copper concentrations were found by subtracting dissolved concentrations from total concentrations.

Flowing water was also sampled at each residence. The intent was to obtain a flowing water sample and then allow the water to stagnate for profile sampling. Sites C1, C2, A1, J1, J2, B1, and B2 were able to do this. Sites A2, I1 and I2 drew the flowing water sample just after the stagnation period. There were no flowing water samples at Sites A1 and A2 in April or August of 2015.

A longer list of parameters was run by the EPA laboratory in August/September 2015 sampling than in the November/December 2015 sampling. When ND (no detection) was reported on a laboratory report, the limit of detection was substituted for the result in the graphs in this chapter.

Site IDs for the residential profile sampling are listed below in Table 3.1.

Table 3.1
Project #4586 residential sampling sites

Water System	Site Code	Phosphate Addition
I	I1	yes
I	I2	yes
C	C1	yes
C	C2	yes
J	J1	yes
J	J2	yes
B	B1	no
B	B2	no
A	A1	yes
A	A2	yes

FLOWING WATER CHARACTERISTICS

Analyses of flowing water samples show that all five water systems have similar source water – Lake Michigan (Table 3.2).

All water systems add a phosphate product except System B (Sites B1 and B2). Phosphate products are listed in Table 2.8 and Table 8.1. In Table 3.2, Water System C had phosphorus below the detection limit of 0.012 mg/L as P even though phosphate was being dosed into the system water.

Table 3.2
Project #4586 residential sampling flowing water characteristics

Aug/Sep 2015	I1	I2	C1	C2	J1	J2	B1	B2	A1	A2
Calcium in mg/L	34.0	34.2	33.3	34.3	33.6	33.3	34.2	33.6		
Magnesium in mg/L	11.7	11.8	11.3	11.7	11.7	11.6	11.4	11.4		
Chloride in mg/L	14.3	15.2	13.1	13.3	14.7	14.6	13.6	13.6		
Fluoride in mg/L	0.61	0.52	0.60	0.58	0.67	0.63	0.63	0.61		
Phosphorus in mg/L as P	0.58	0.52	ND	ND	0.48	0.42	ND	ND		
Orthophosphate in mg/L as P									0.23	0.22
Potassium in mg/L	1.36	1.42	1.36	1.38	1.49	1.48	1.3	1.28		
Silica in mg/L as SiO2	1.95	2.13	2.02	2.02	1.69	1.62	2.19	2.15		
Sodium in mg/L	8.93	9.92	7.28	7.42	8.01	7.96	8.15	8.12		
Sulfate in mg/L	27.4	26.9	24.9	25.0	22.2	22.3	21.8	21.9		
Total Alkalinity in mg/L as CaCO3	100	100	100	100	100	100	110	110		

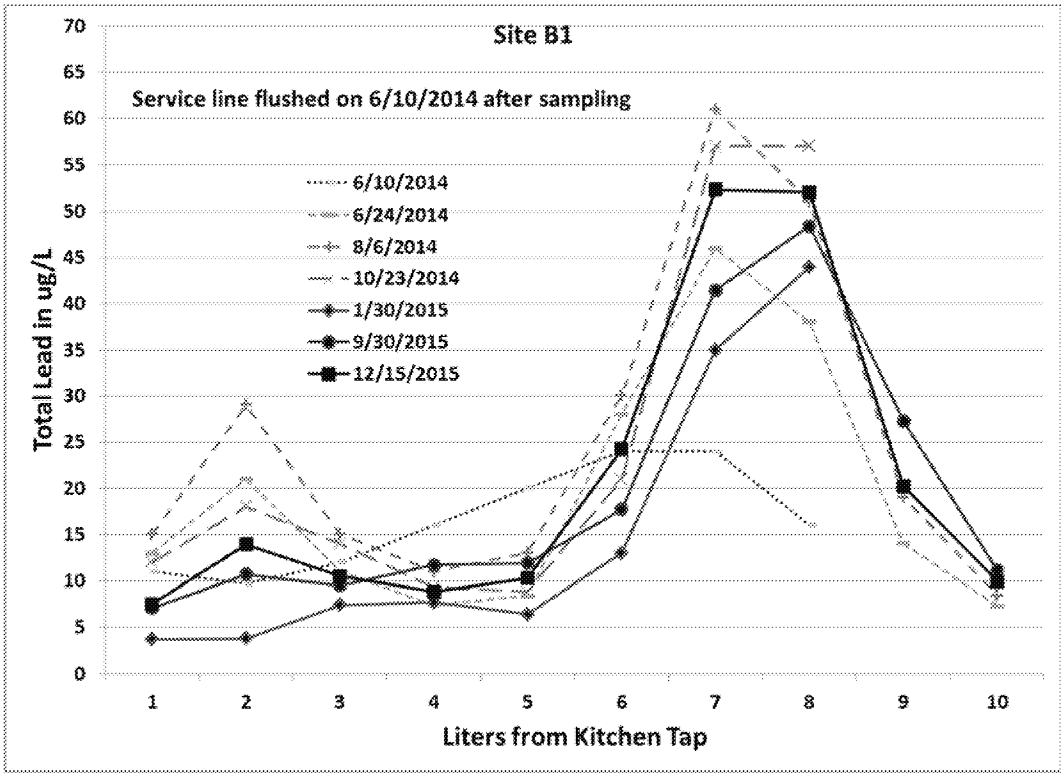
Nov/Dec 2015	I1	I2	C1	C2	J1	J2	B1	B2	A1	A2
Calcium in mg/L	33.7	33.9								
Magnesium in mg/L	11.9	12.0								
Chloride in mg/L	14.9	13.6	15.8	16.5	19.9	20.2	15.5	15	15	15.6
Fluoride in mg/L	0.49	0.46	0.69	0.57	0.71	0.71	0.73	0.71	0.75	0.74
Phosphorus in mg/L as P	0.50	0.52								
Potassium in mg/L	1.39	1.34								
Silica in mg/L as SiO2	2.45	2.35								
Sodium in mg/L	9.23	9.11								
Sulfate in mg/L	28.8	26.9	26.8	26.5	23.7	23.7	23.5	23.7	25.5	25.8
Total Alkalinity in mg/L as CaCO3	100	99	100	100	110	110	110	110	110	110

ND=no detection; concentration below the laboratory limit of detection

LEAD CONCENTRATIONS IN RESIDENTIAL PROFILES

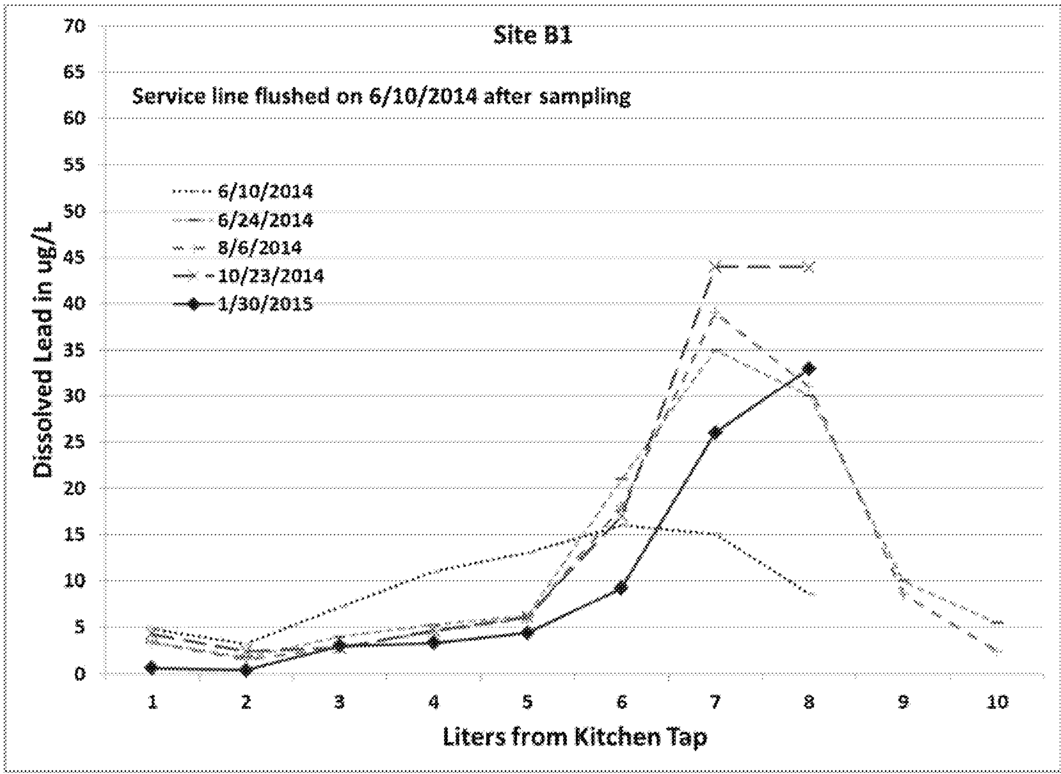
System B began sampling two residences in June of 2014 and was able to differentiate between dissolved and particulate lead in the earlier sampling periods.

In Site B1, after the first profile sampling, the lead service line was flushed. Instead of cleaning out particulate lead, the flushing resulted in higher dissolved lead. The lead in the lead service line was still elevated by the last sampling on 12/15/2015. See Figure 3.1 for total lead concentrations and Figure 3.2 for the dissolved and particulate lead fractions.



Liters from Kitchen Tap	Piping Material Associated with Sample
1	Galvanized iron pipe
2	Galvanized iron pipe
3	26% of length galvanized iron pipe and 74% copper pipe
4	Copper pipe
5	Copper pipe
6	4% of length copper pipe and 96% lead pipe
7	Lead pipe
8	21% of length lead pipe and 79% water main
9	Water main
10	Water main

Figure 3.1 Residential profile sampling: Site B1 total lead concentrations



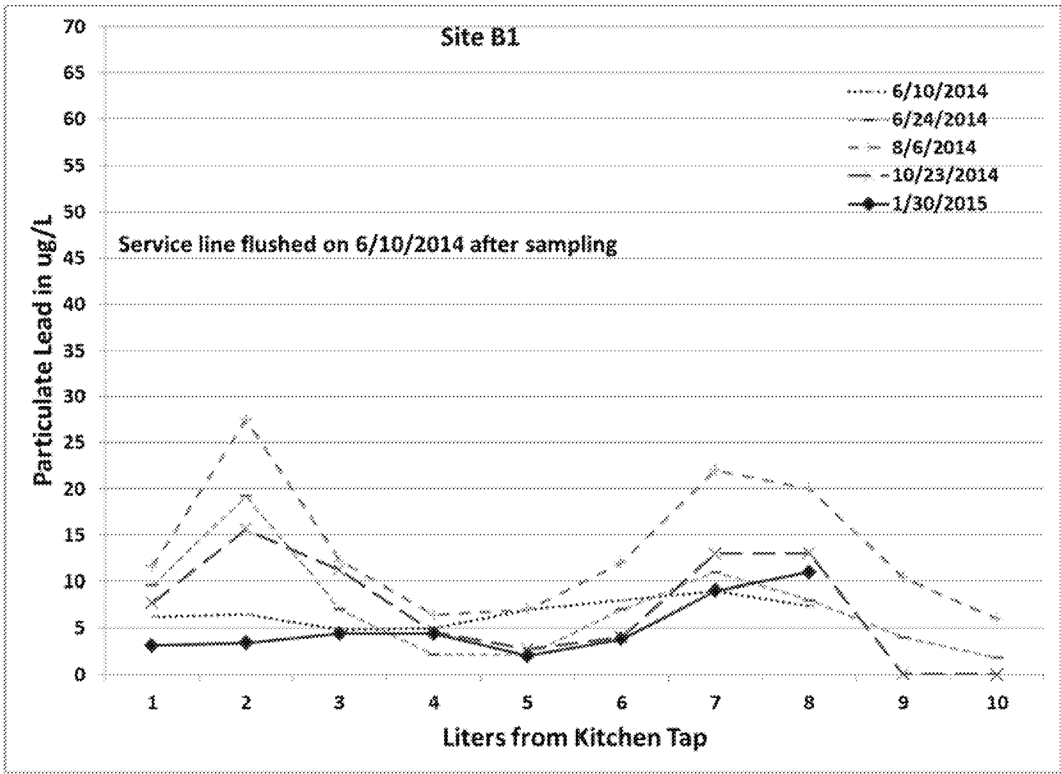
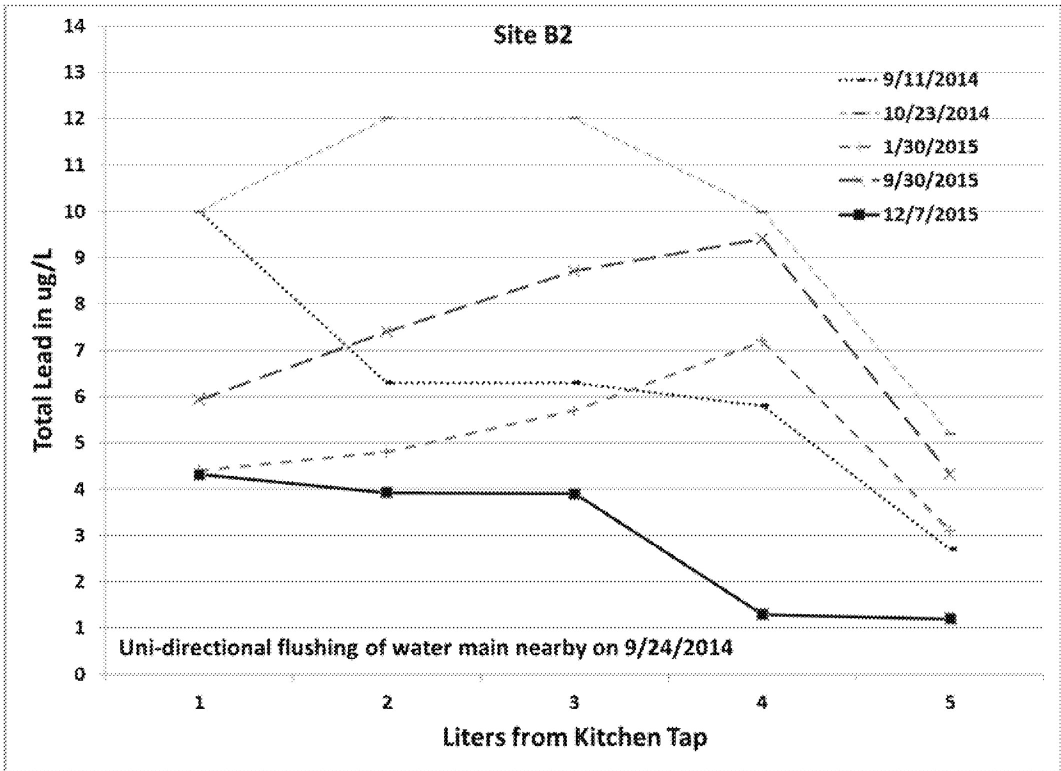


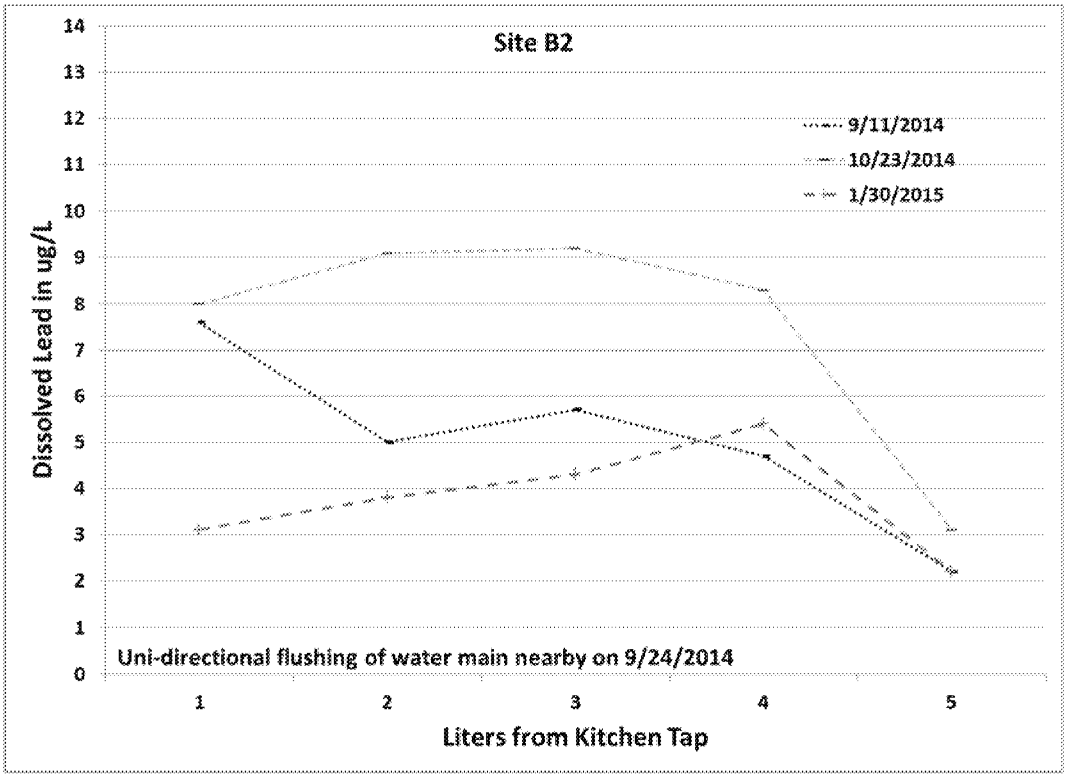
Figure 3.2 Residential profile sampling: Site B1 dissolved and particulate lead concentrations

For Site B2, the first sampling was performed before uni-directional flushing of water mains occurred nearby on 9/24/2014. Subsequent sampling showed elevated dissolved lead, but all levels had fallen to lower concentrations by the final sampling on 12/7/2015. The elevated lead concentrations never exceeded 15 µg/L. See Figures 3.3 and 3.4.



Liters from Kitchen Tap	Piping Material
1	Copper pipe
2	Copper pipe
3	48% of length copper pipe and 52% lead pipe
4	48% of length lead pipe and 52% water main
5	Water main

Figure 3.3 Residential profile sampling: Site B2 total lead concentrations



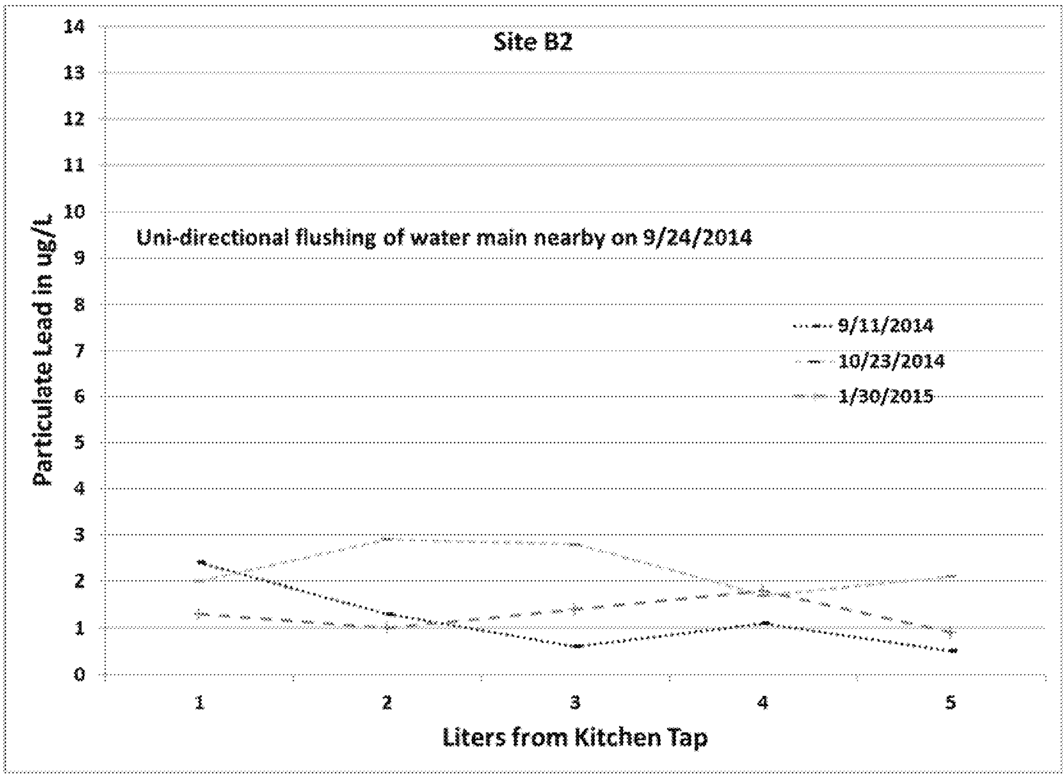


Figure 3.4 Residential profile sampling: Site B2 dissolved and particulate lead concentrations

System A performed profile sampling on two residences in April and August of 2015 using a commercial laboratory for analyses and then in November using the EPA laboratory. Uni-directional flushing of water mains occurred nearby both sites in May 2015. Lead concentrations were differentiated into dissolved and particulate forms in August and showed that a large percentage of lead was in particulate form. There was not enough information to determine if nearby water main flushing may have influenced the increase of the particulate lead concentration in the water or if some other factor may have been involved. Site A2 lead concentrations eventually fell to lower levels but Site A1 lead concentrations ended higher than in the first sampling. See Figures 3.5 and 3.6.

No water main flushing was performed in Systems I, C, and J. All of the residential profile lead concentrations dropped as the summer conditions entered into winter conditions. See Figure 3.7.

It should be noted that lead concentrations in lead pipe lines can still be excessive even when a phosphate product is used for control of lead release. Water Systems A and I use a high dose of mostly orthophosphate products and each system measured one home with lead levels over 15 µg/L. System J uses a lower dose of a poly/ortho blend and measured one home with lead levels over 15 µg/L. System B does not use a phosphate chemical and measured one home with lead levels over 15 µg/L. System C uses a low dose of a poly/ortho blend and found both residences with lead under 15 µg/L.

In these profiles, differentiation of lead into dissolved and particulate forms was done only in two systems. Therefore, nothing can be said about the nature of the lead in the other profiles or their potential mechanisms of release. It is interesting to note that System A, using a high dose of a mostly orthophosphate product, measured a high percentage of particulate lead profiled through both residences.

COPPER CONCENTRATIONS IN RESIDENTIAL PROFILES

Copper concentrations in profile sampling are highest near the sampling tap because residences commonly have more copper at that location. None of the residences sampled exhibited extreme copper concentrations. This can be seen in Figures 3.8 and 3.10.

In differentiating two sites' samples in System A into dissolved and particulate copper, dissolved copper appeared to predominate as opposed to a greater role played by lead particulates in the same residences. Refer to Figure 3.9.

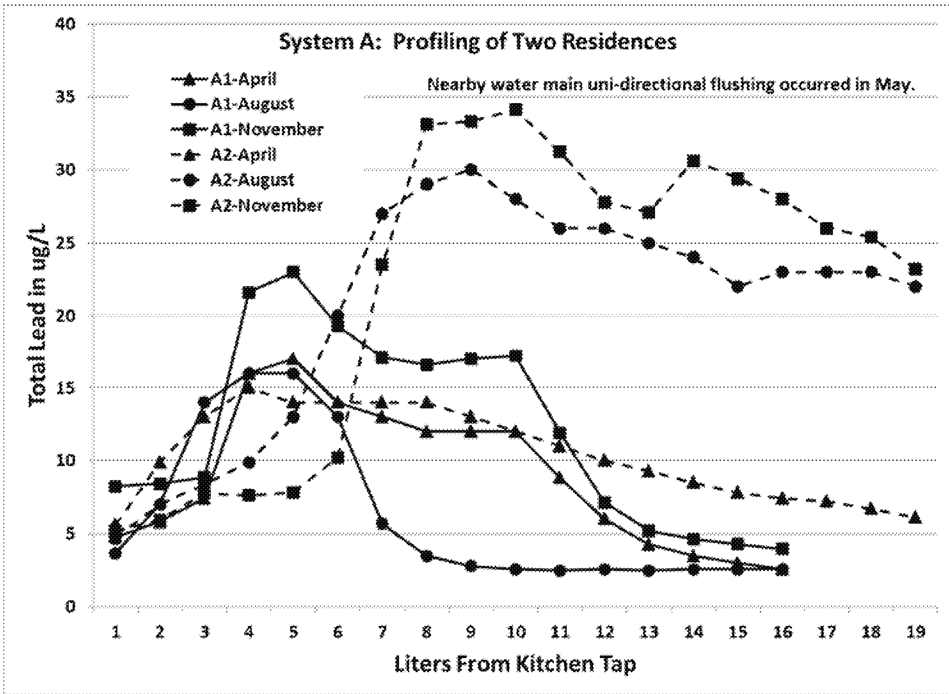
OTHER METALS' CONCENTRATIONS IN RESIDENTIAL PROFILES

Iron, manganese, and aluminum have been associated with adsorbing, accumulating, and transporting lead and copper in water systems (Schock et al. 2014). Iron was measured in significant concentrations in Sites I1 and A2 in August near the sampling faucet.

Manganese was not measured above the laboratory's limit of detection. Zinc was present in all residences, especially closer to the sample tap. Zinc indicates the presence of galvanized steel piping and certain metal alloys.

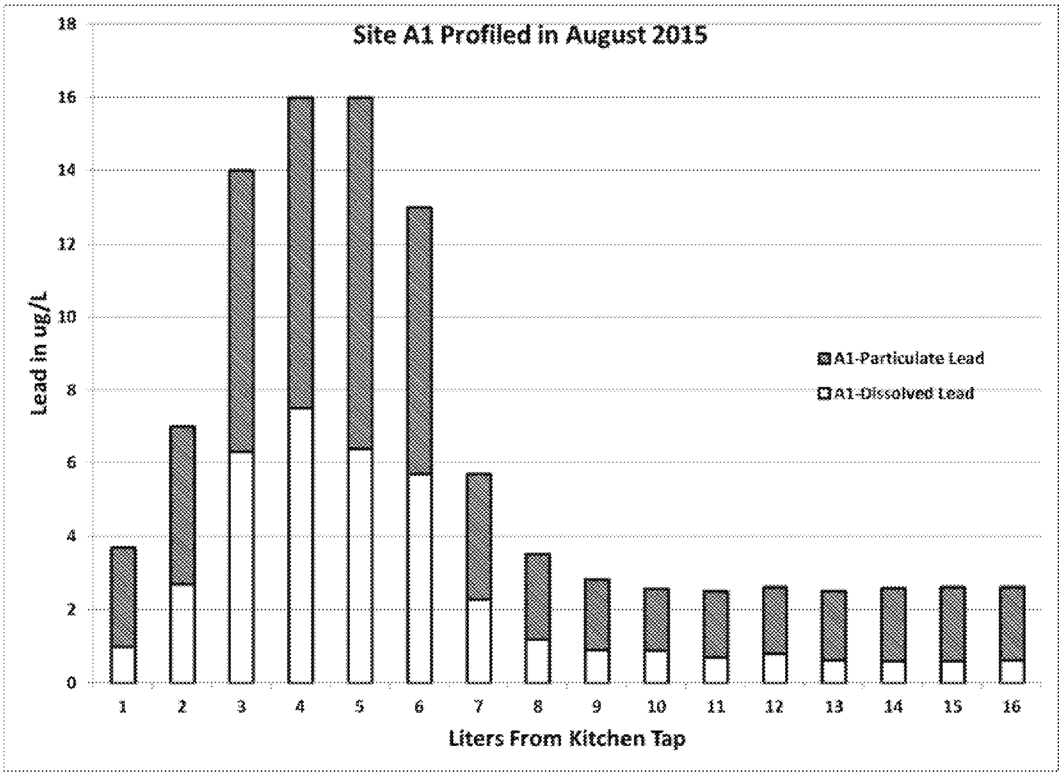
Aluminum was not measured above the laboratory's limit of detection. Cadmium and nickel were not measured above the laboratory's limit of detection.

Refer to Figures 3.11 to 3.14 for iron and zinc levels.



Site A1		Site A2	
Liters from Kitchen Tap	Piping Material	Liters from Kitchen Tap	Piping Material
1	Copper pipe	1	Copper pipe connected to galvanized pipe
2	Copper pipe	2	Copper pipe
3	Galvanized iron pipe	3	Copper pipe
4	Galvanized iron pipe	4	Copper pipe
5	Lead pipe	5	Copper pipe
6	Lead pipe	6	Lead pipe
7	Lead pipe	7	Lead pipe
8	Lead pipe	8	Lead pipe
9	Lead pipe	9	Lead pipe
10	Lead pipe	10	Lead pipe
11	Lead pipe	11	Lead pipe
12	Lead pipe	12	Lead pipe
13	Lead pipe	13	Lead pipe
14	Lead pipe	14	Lead pipe
15	Water main	15	Copper pipe
16	Water main	16	Copper pipe
		17	Copper pipe
		18	Water main
		19	Water main

Figure 3.5 Residential profile sampling: Sites A1 and A2 total lead concentrations



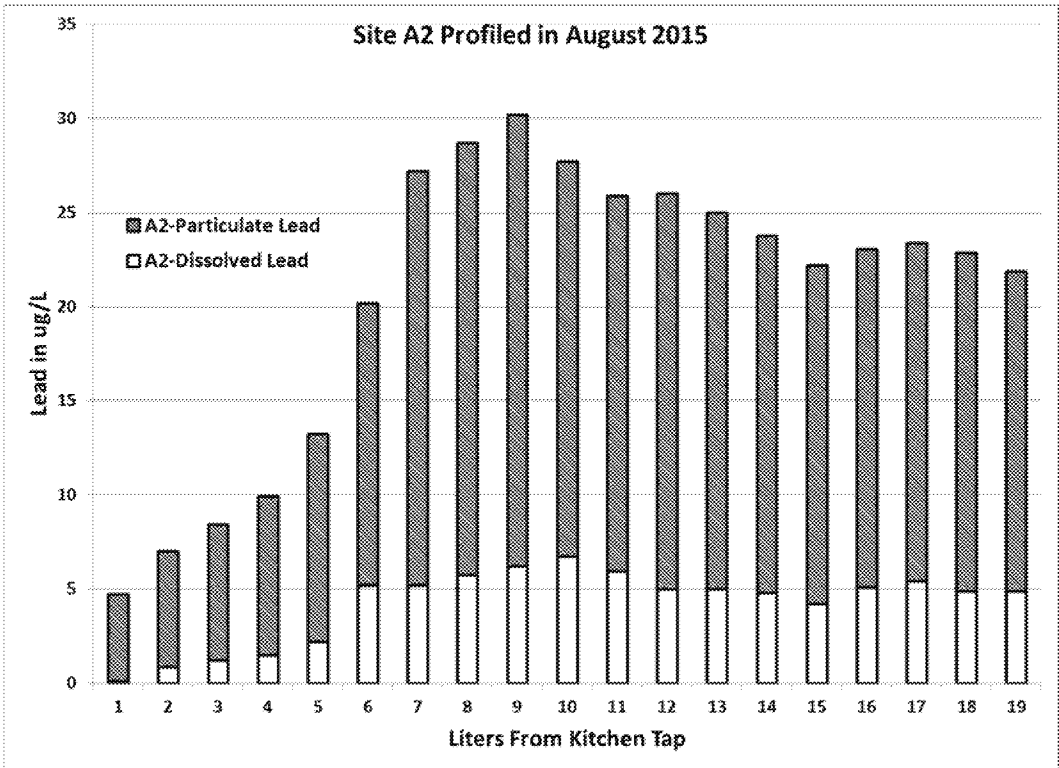


Figure 3.6 Residential profile sampling: Sites A1 and A2 dissolved and particulate lead concentrations

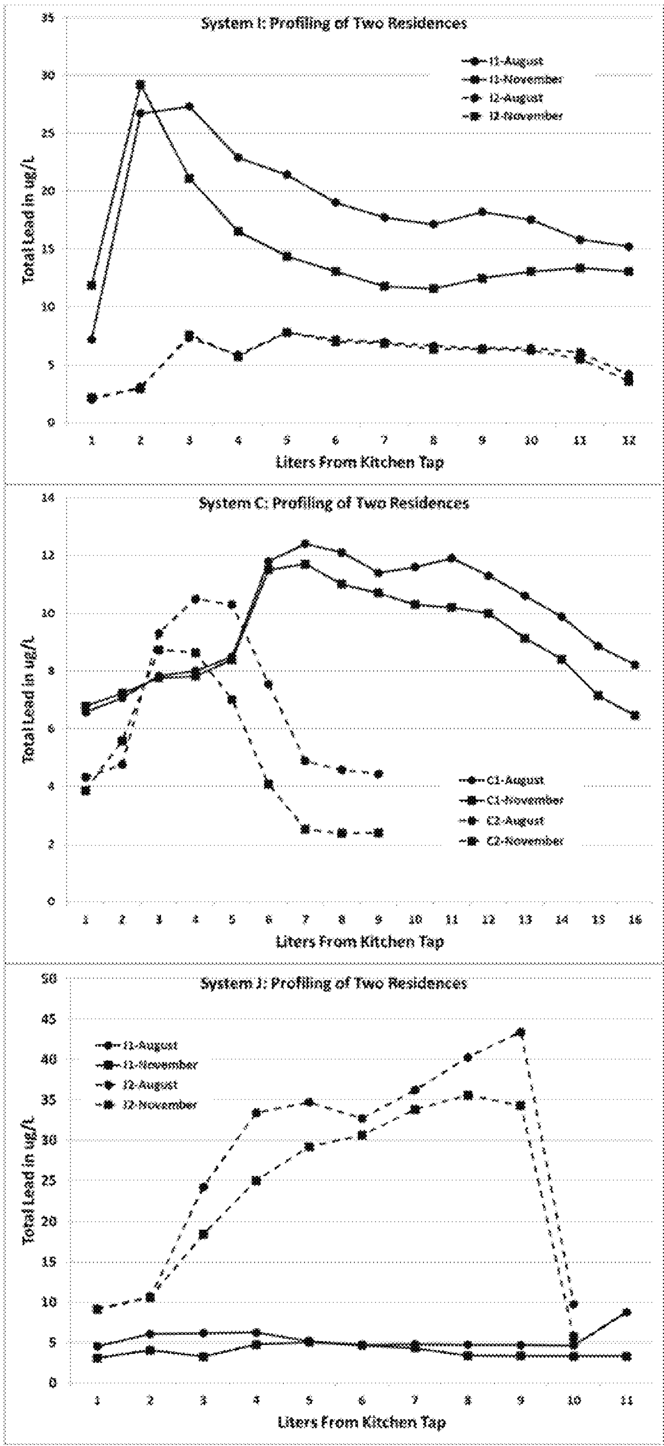
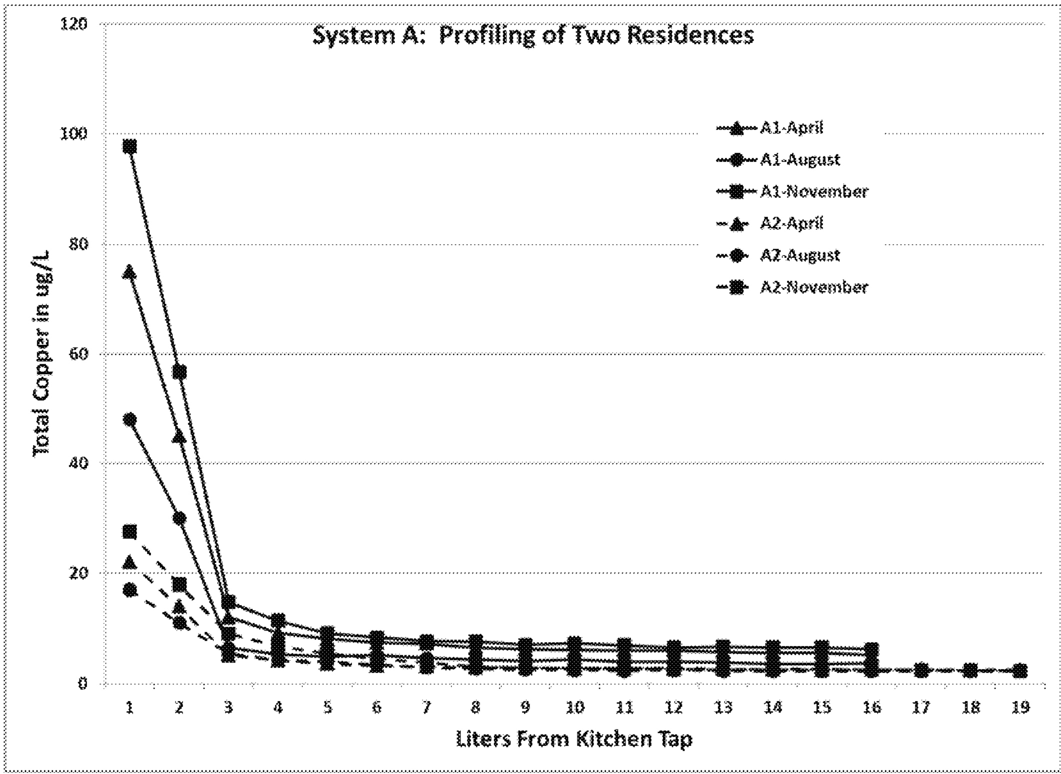


Figure 3.7 Residential profile sampling: Systems I, C, and J total lead concentrations



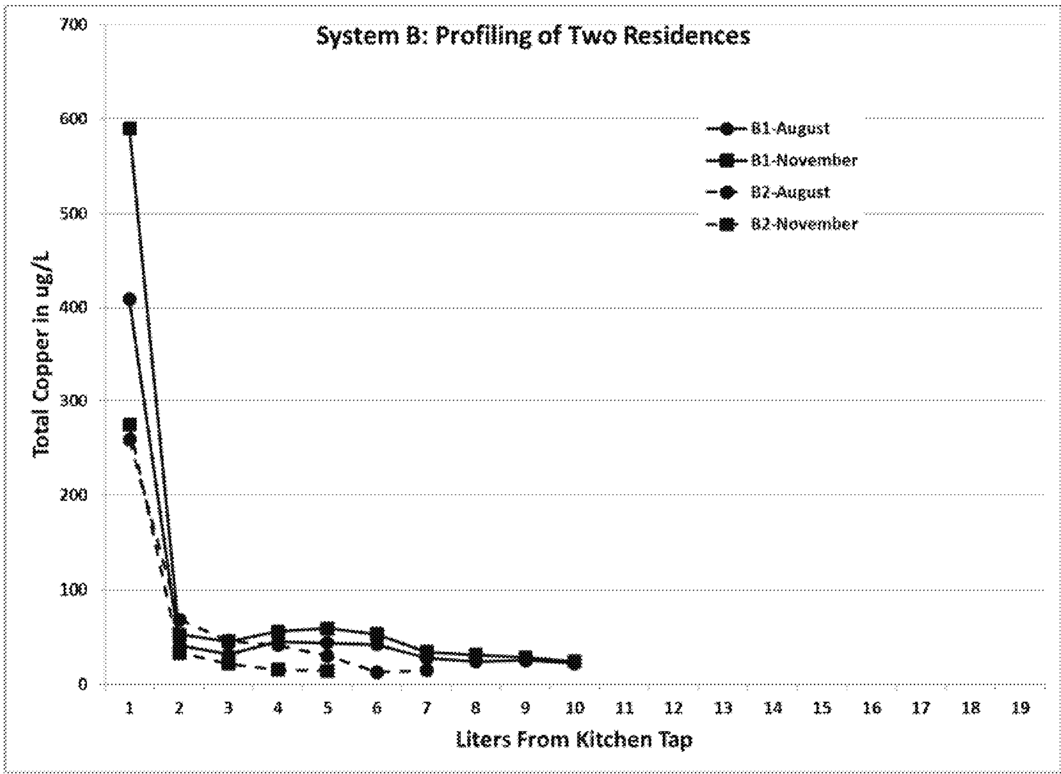
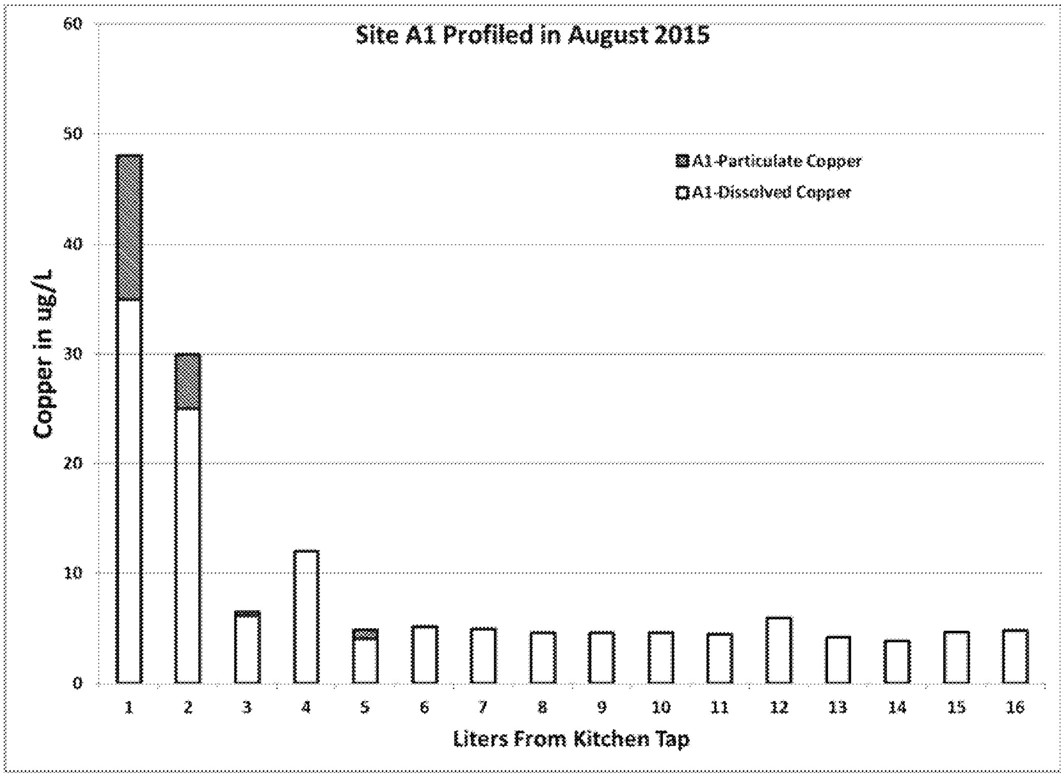


Figure 3.8 Residential profile sampling: Systems A and B total copper concentrations



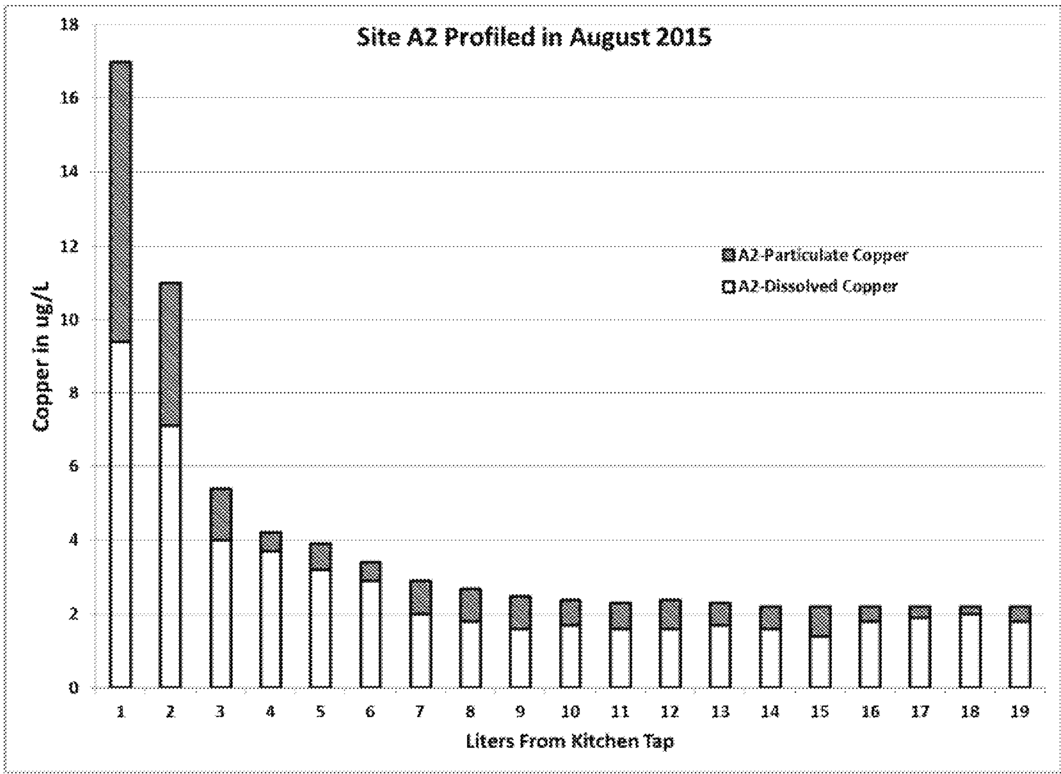


Figure 3.9 Residential profile sampling: Sites A1 and A2 dissolved and particulate copper concentrations

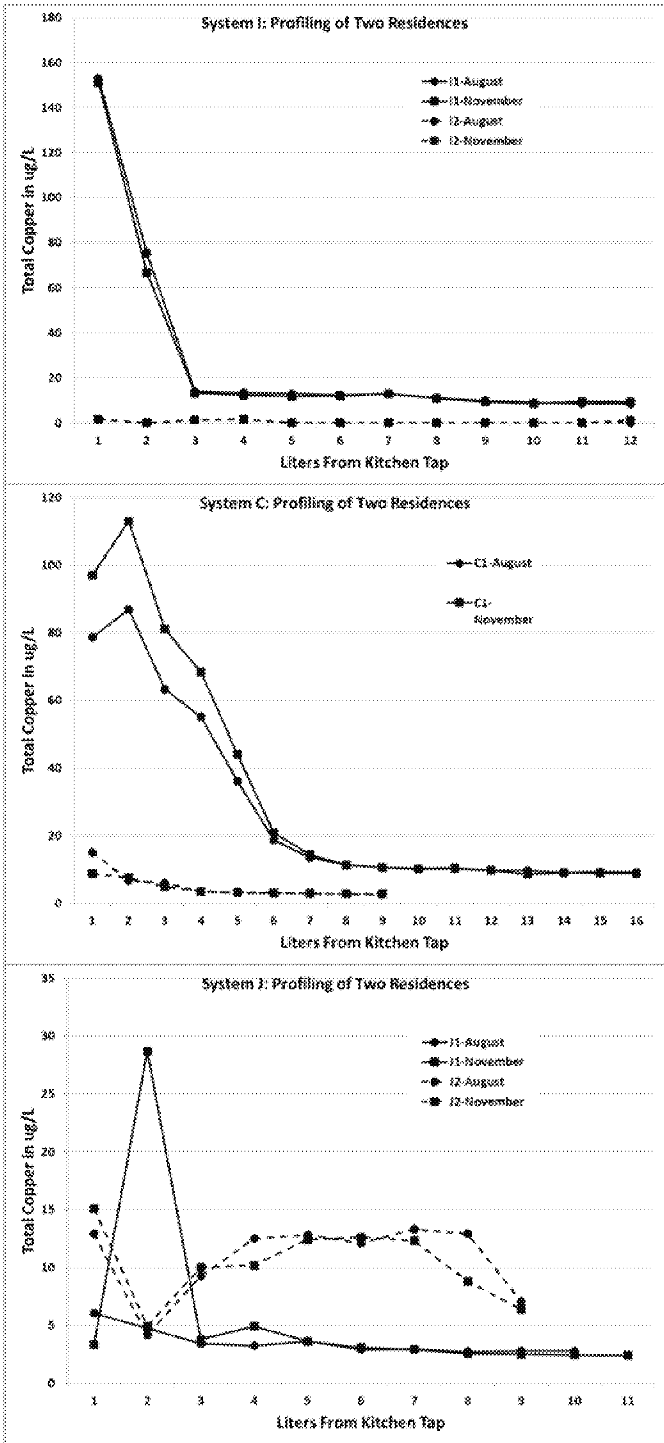


Figure 3.10 Residential profile sampling: Systems I, C, and J total copper concentrations

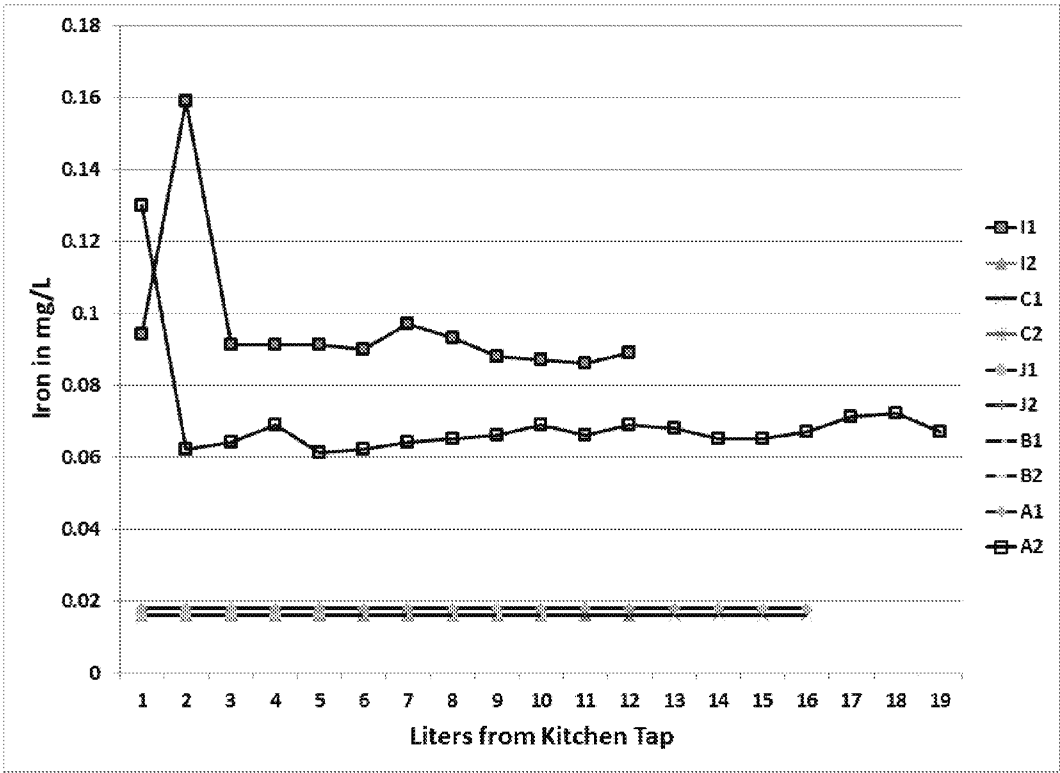


Figure 3.11 Residential profile sampling: Iron measured Aug/Sep 2015

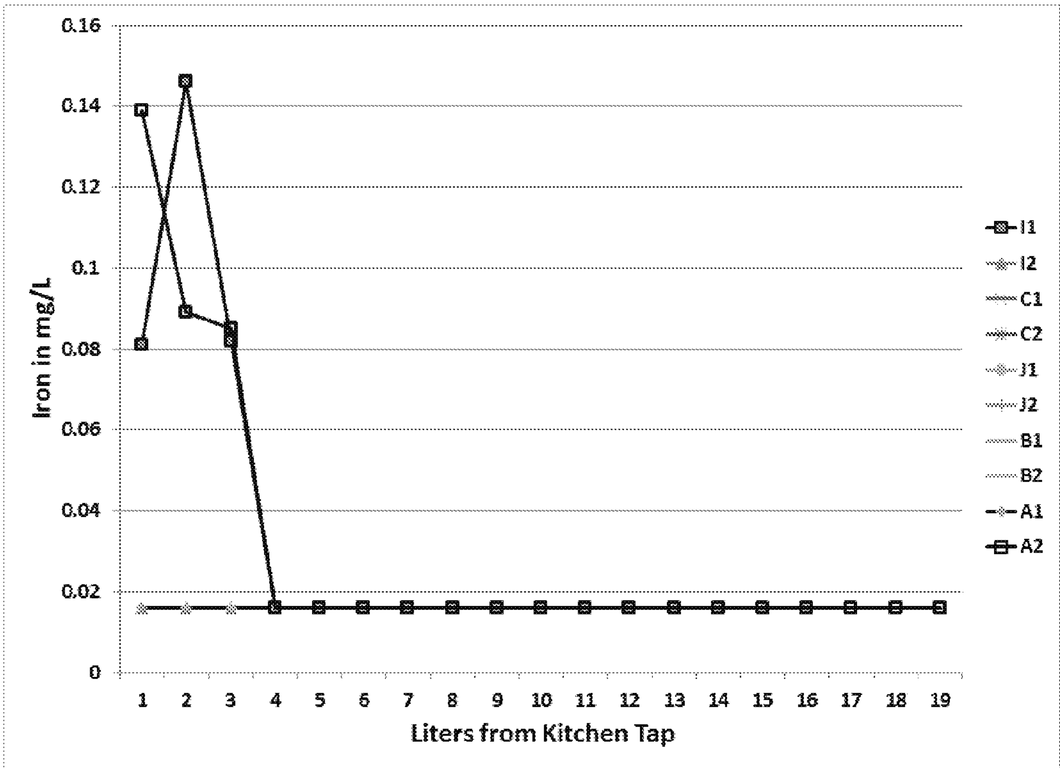


Figure 3.12 Residential profile sampling: Iron measured Nov/Dec 2015

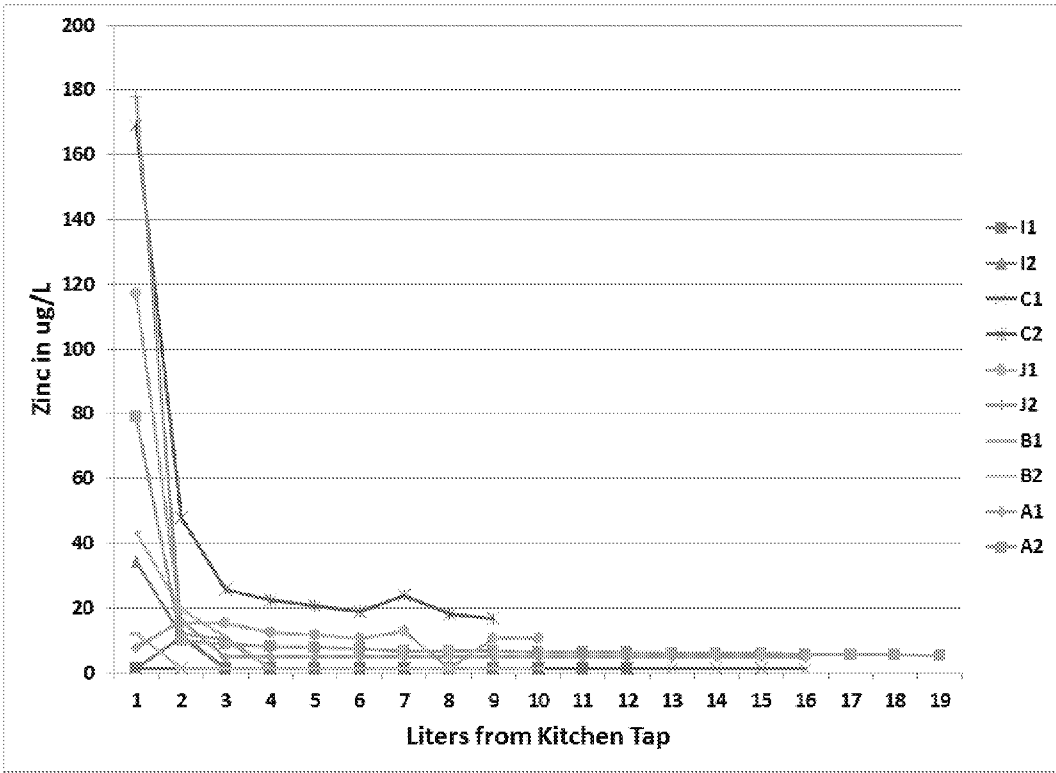


Figure 3.13 Residential profile sampling: Zinc measured Aug/Sep 2015

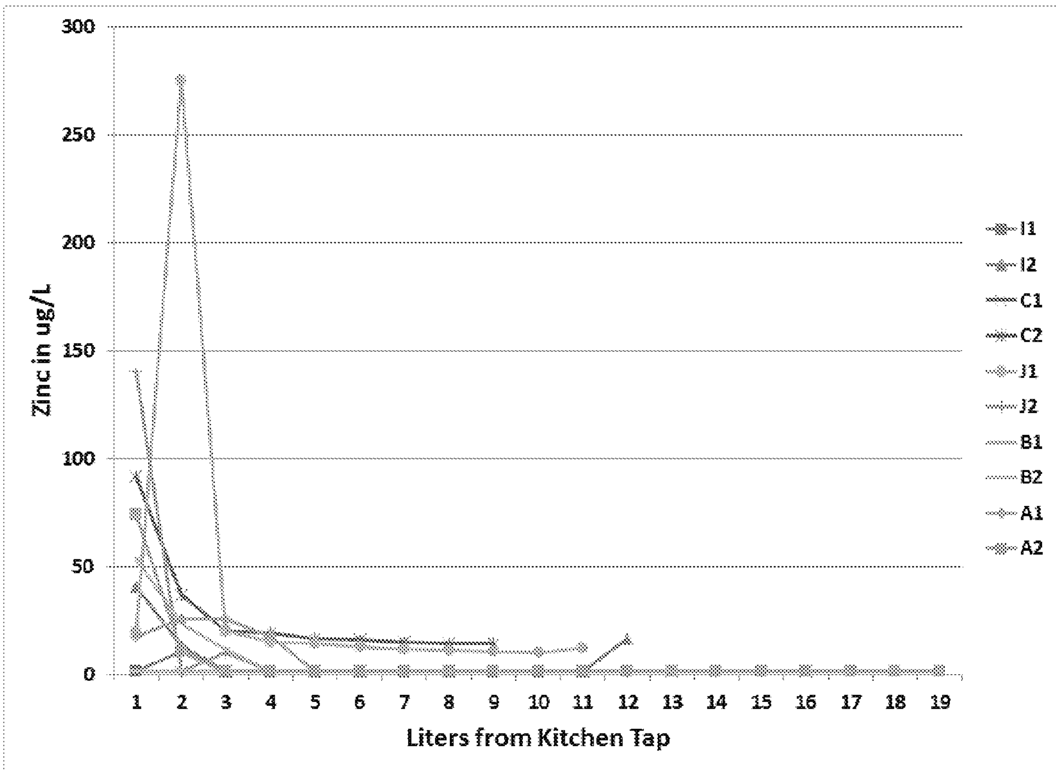


Figure 3.14 Residential profile sampling: Zinc measured Nov/Dec 2015

SUMMARY

Personnel from five water systems using Lake Michigan water performed profile sampling on two residences per water system to view the metals release in pipe sections from the kitchen tap through the building piping, lead service line and into the water main.

It was seen that high lead release could be experienced in water systems feeding phosphate-based chemical products as well as the one system not using phosphate.

Two water systems ran extra analyses to differentiate dissolved lead from particulate lead. Water System A had high particulate lead concentrations while Water System B had high dissolved lead. These findings will be compared to the distribution system monitoring data discussed later in this report.

Attempts at cleaning the water mains and the lead service lines created greater release of lead. In one system (Water System A), the greater release was in particulate form. In another system (Water System B), the greater release of lead was in dissolved form.

Copper release was not as dramatic as the lead release in these water systems.

Other metals were present, such as zinc from galvanized steel piping or metal alloys. There were not enough data to run correlative analyses of other water quality parameters with lead and copper release.

These characterizations of water quality at several critical residences in the water systems under study are important for later comparisons to general water distribution system monitoring results using a special monitoring station. The residential data help in validating the general results; the general results help in explaining the residential data.

CHAPTER 4
DISTRIBUTION SYSTEM DISINFECTION CONCENTRATIONS AND TURBIDITY MEASUREMENTS

This project explored the relationship between system cleanliness and biostability to lead and copper release from pipe material into water. Two easily accessible and economical field test parameters by definition represent system cleanliness and biostability.

Disinfection concentration is one of the parameters. When disinfection concentration is low at a location in a water distribution system, it means that the chemical has been used up. This is especially evident when the concentration is compared to the original dose at the entry points to the distribution system. The disinfection can be depleted by interactions with existing pipe wall chemical scale compounds or by interactions with existing microorganisms and biofilms in the system as well as bulk water chlorine demand compounds. Disinfection depletion is also a function of water age (residence time) in the water system with longer exposure to disinfection-depleting factors. If the pipe walls are clear of chemical scales and water and pipe wall debris devoid of microbiological populations and their organic secretions and if residence time in the water system is not excessive, disinfection concentration can be found to be at similar levels around the distribution system as was freshly dosed at the entry points to the distribution system. In this way, disinfection concentration is an indicator of the chlorine demand of the water and pipe wall accumulations, an indicator of the cleanliness and biostability of the water system. Although disinfection needs vary, anecdotally, if concentrations are below 0.3 mg/L free chlorine for chlorine disinfection or below 1 mg/L total chlorine for chloraminated systems, there are most likely not adequate levels of disinfection to defend against excessive growth of microorganisms.

Another easily obtainable water quality parameter is turbidity. Turbidity is a measure of particulates entrained in the water. Particulates can represent inert material such as sand, chemical scale particles such as particulate iron or manganese, microorganisms, or biofilm materials. In this way, turbidity is another indicator of water system cleanliness and biostability. Turbidity should not exceed 1 NTU in the distribution system based on a study of the potential to form biofilms in water systems (LeChevallier et al. 2015).

If disinfection concentrations and turbidities can be routinely tracked at set locations around the distribution system, then this is the equivalent of tracking the status of cleanliness and biostability over time and location. Problem locations or operational periods can be pinpointed and remedied.

Conveniently, one of the Federal drinking water regulations, the Total Coliform Rule, requires water utility personnel to select flowing water sampling sites around the distribution system to represent geographical changes in water quality. This regulation is focused on the weekly monitoring and monthly reporting for indicators of pathogenic microorganisms that could cause immediate illness to consumers. The presence of microorganisms (total coliform bacteria) that indicate possible contamination of drinking water by sewage is measured at these sites. In addition to the total coliform count, disinfection concentration is measured by many water systems. It is the disinfection concentration that was of interest in this project for reasons cited above. Some of the water system personnel participating in this project also added the measurement of turbidity during routine visits to Total Coliform Rule sites. Other already established distribution system regulatory sites or utility operational sampling sites can be used for this purpose as well.

In this project, Water Systems A, B, C, I, and L provided data so that disinfection concentration and turbidity could be plotted over time per sampling site. An example of the graph produced for both disinfection concentration and turbidity at each sampling site is shown in Figure 4.1. The type of graph is called a Shewhart Control Chart. Its features are explained in Chapter 5. For now, we can see from Figure 4.1 that the turbidity varied greatly at specific times. Inspection of the graph should be the motivation to study system conditions and operations at the date when the turbidity exceeded the upper boundary of a range where 99% of the data were statistically expected to fall.

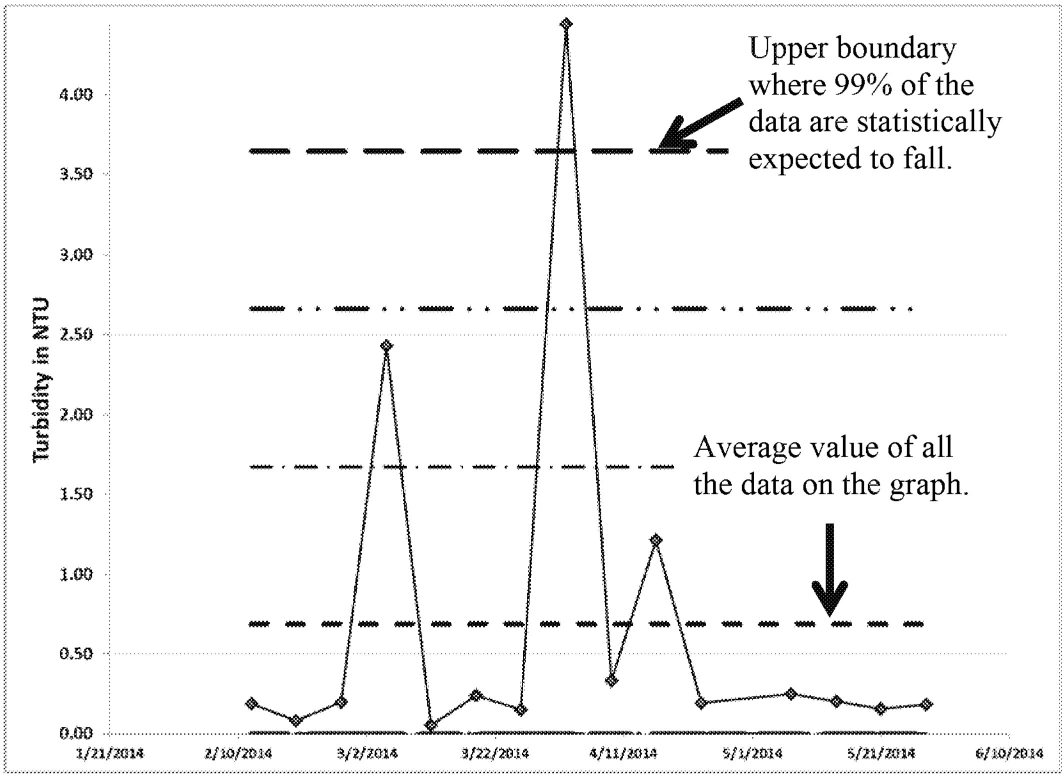


Figure 4.1 Example graph for each parameter at each TCR sampling site

Also, why did the turbidity in Figure 4.1 exceed the average value on two dates when all the other data stayed below the average? Since turbidity can represent chemical particulates in the water as well as microorganisms and biofilm material in the water, these graphs indicate a disruption to the cleanliness and/or biostability of the system. The graphs are guides to pinpointing the system conditions and operational issues at a specific time and location that affect water quality.

The data for each graph can be selected over specific time periods. For example, graphs of quarterly data may be of great interest. The quarters of a year coincide with seasons and water temperature. In comparing quarterly graphs, one may discover changes to cleanliness and biostability based on time of year.

Unfortunately, there is another consideration that may make a quarterly graph impractical. That consideration is the number of data points. The less data points, the less accurate the representative statistics are. With the Shewhart Control Charts, it is best to calculate statistics based on twenty or more data points (Wheeler and Chambers 1992). Using less data points is acceptable, but the statistics are less accurate. The charts are explained further in Chapter 5. For now, it is only important to consider how many data points are in a time period that one wishes to study.

In order to use enough data points, the comparative graphs in Figures 4.2 to 4.7 are based on the first (Semester 1) and second (Semester 2) six months of the year. Instead of studying each site graph, their statistics are compiled onto one graph. The statistics used are the average and the variability of results. The sites are sorted by increasing averages so that the sites with the highest and the lowest averages are evident. Site names are typically shown on the X-axis but are not shown in this report. For disinfection concentration, the sites with the lowest averages are of concern. For turbidity, the sites with the highest averages are of concern. These comparison graphs identify which sites should be studied and taken action on.

In addition to the averages, the comparison graphs in Figures 4.2 to 4.7 also show the degree to which the disinfection concentration or the turbidity varies at each site. The variation is shown by the symbols ("whiskers") above and below each average connected with a line. The symbols represent the upper and lower boundaries where statistically 99% of all the data are expected to fall. Sites with wide expected variation should also be investigated; a steady proper dose of disinfection is desired at each site and a low steady turbidity at a site is preferred to one with erratic high jumps in particulate matter.

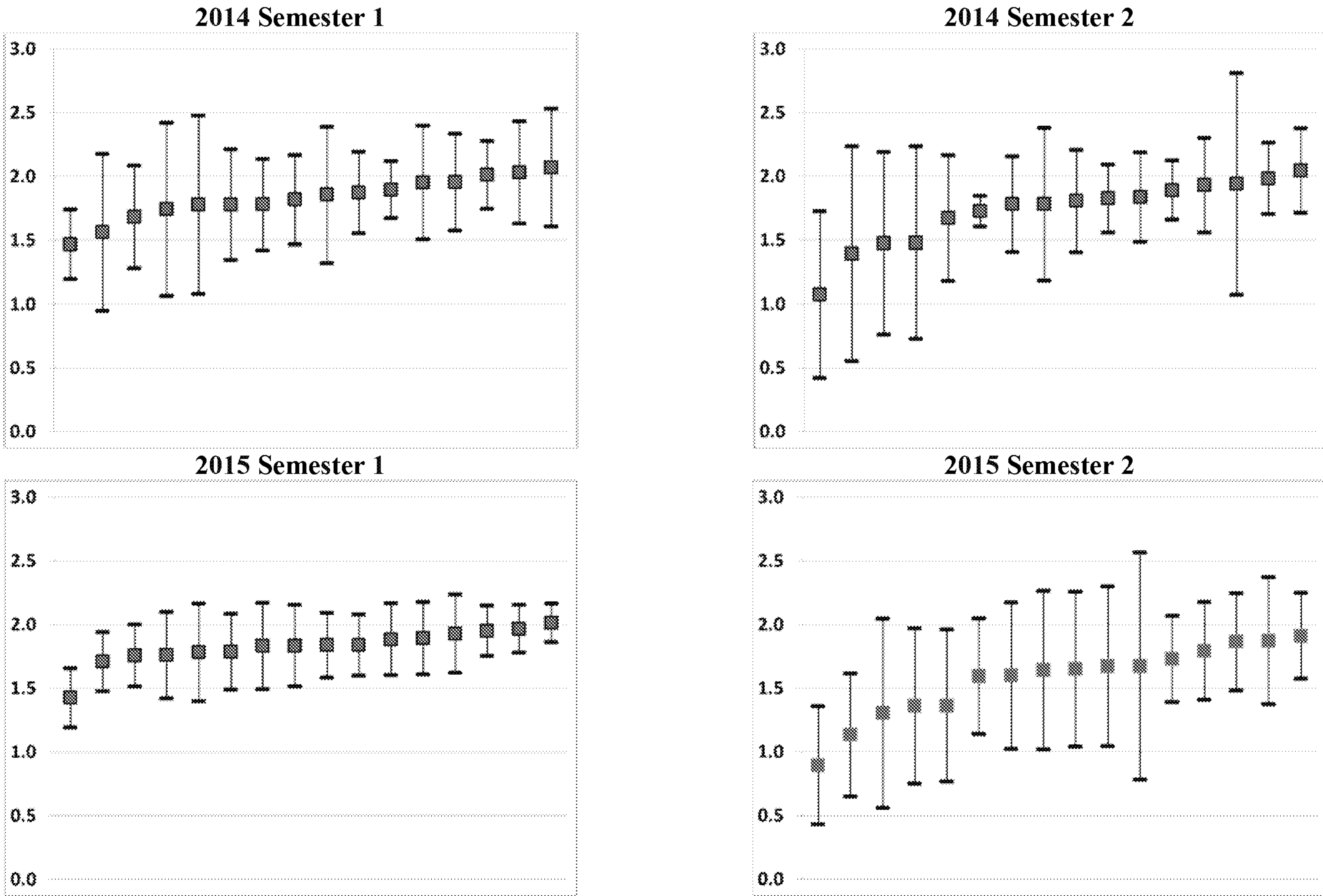
The graphs in Figures 4.2 to 4.7 not only allow for the comparison between sites in a given time period, but also allow for comparison between time periods. For example, in Figure 4.2, the first semester of 2014 can be compared to the second semester of 2014 and the first semester of 2015, etc. It can be determined if turbidity is dropping throughout the water system over time, for example.

Additionally, all of the sites can be compared on a time-series graph together. See Figures 4.8 to 4.13. Each time-series line belongs to a sampling site but the sites are not identified on this graph. Instead, the graph is used to view the overall minimum and maximum results of all sites over the time period and to determine if all sites are exhibiting similar behavior.

Figures 4.14 to 4.17 display the statistical comparison graphs for data covering a year-long time period. This demonstrates that disinfection concentration behavior and turbidity behavior can be compared between years as well as segments of a year. Figures 4.18 to 4.21 show the same data but as time-series in order to study general patterns for the complete water system.

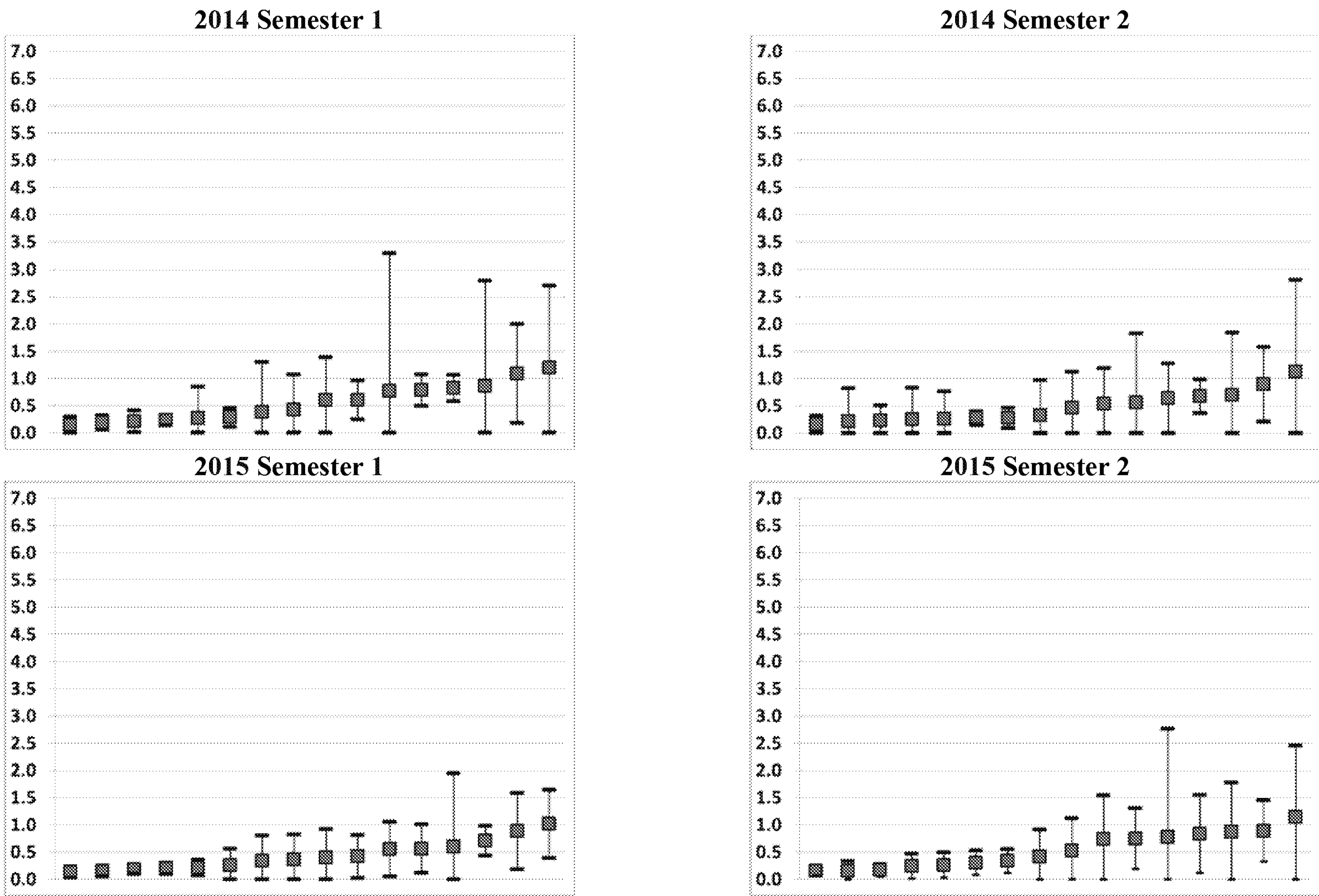
In summary, disinfection concentration and turbidity data taken routinely at Total Coliform Rule sites and any other regularly visited distribution system sites can be tracked and studied to pinpoint operational events that have resulted in reduced water quality.

These graphs will be used in interpreting water system cleanliness and biostability in Chapter 11.



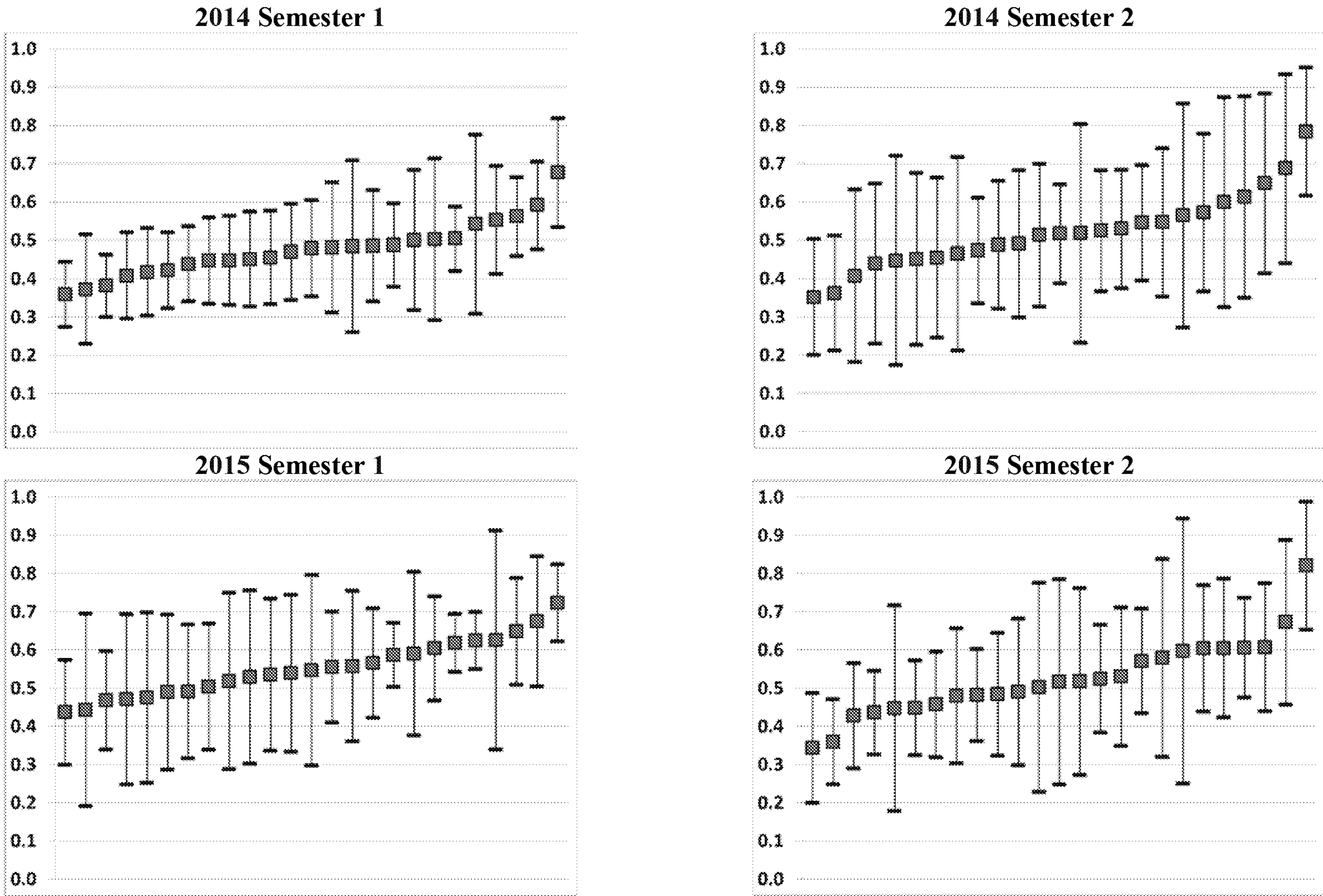
This graph shows the average concentration and variation of total chlorine at each Total Coliform Rule sampling site.
The x-axis would typically identify the sampling site associated with the data but are not shown here.
Each square with "whiskers" represents the average concentration at each sampling site.
The range between the upper and lower "whiskers" is the concentration range where statistically 99% of the concentrations will fall.

Figure 4.2 Water System A: Comparison of total chlorine in mg/L at Total Coliform Rule sites



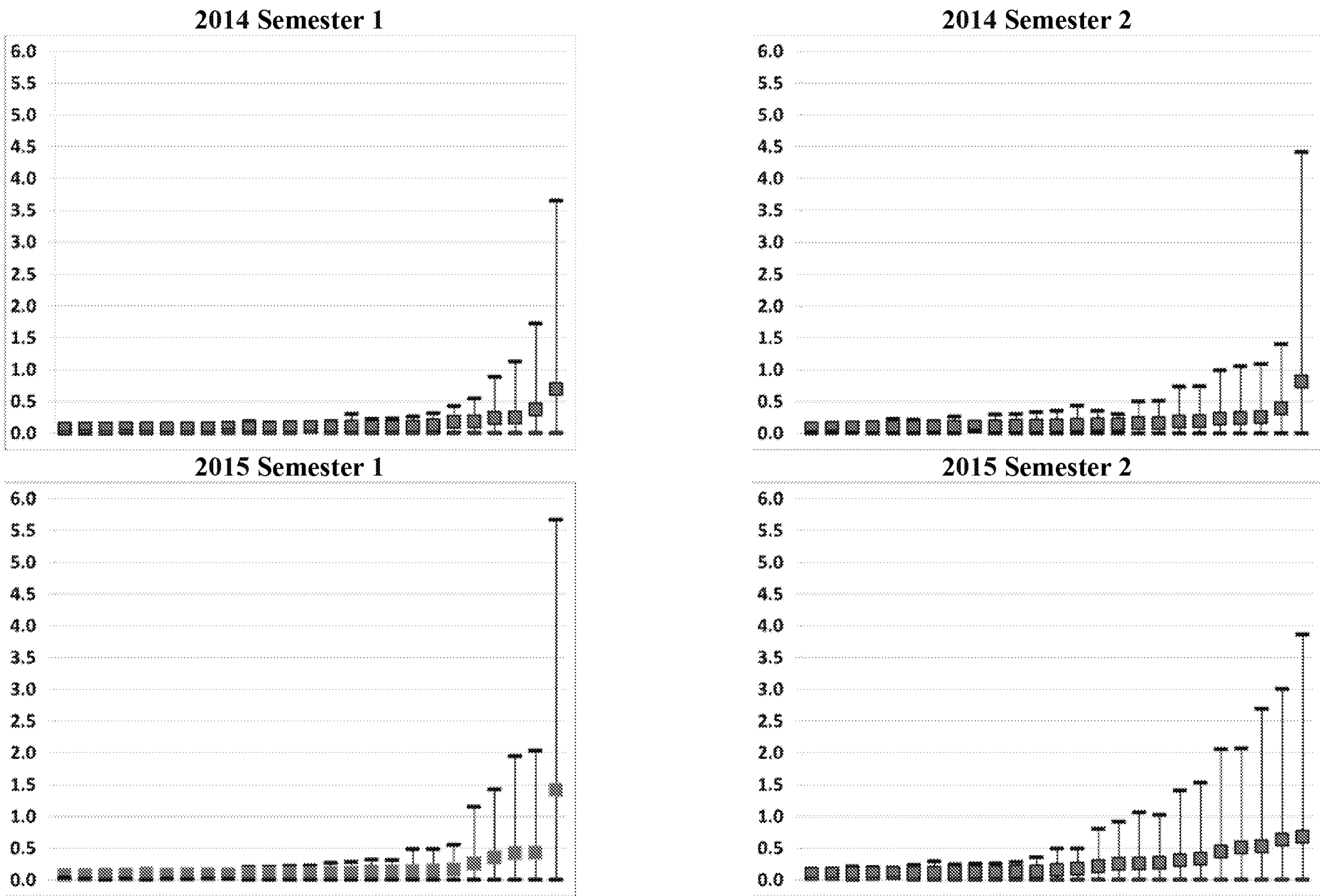
See notes in Figure 4.2.

Figure 4.3 Water System A: Comparison of turbidity in NTU at Total Coliform Rule sites



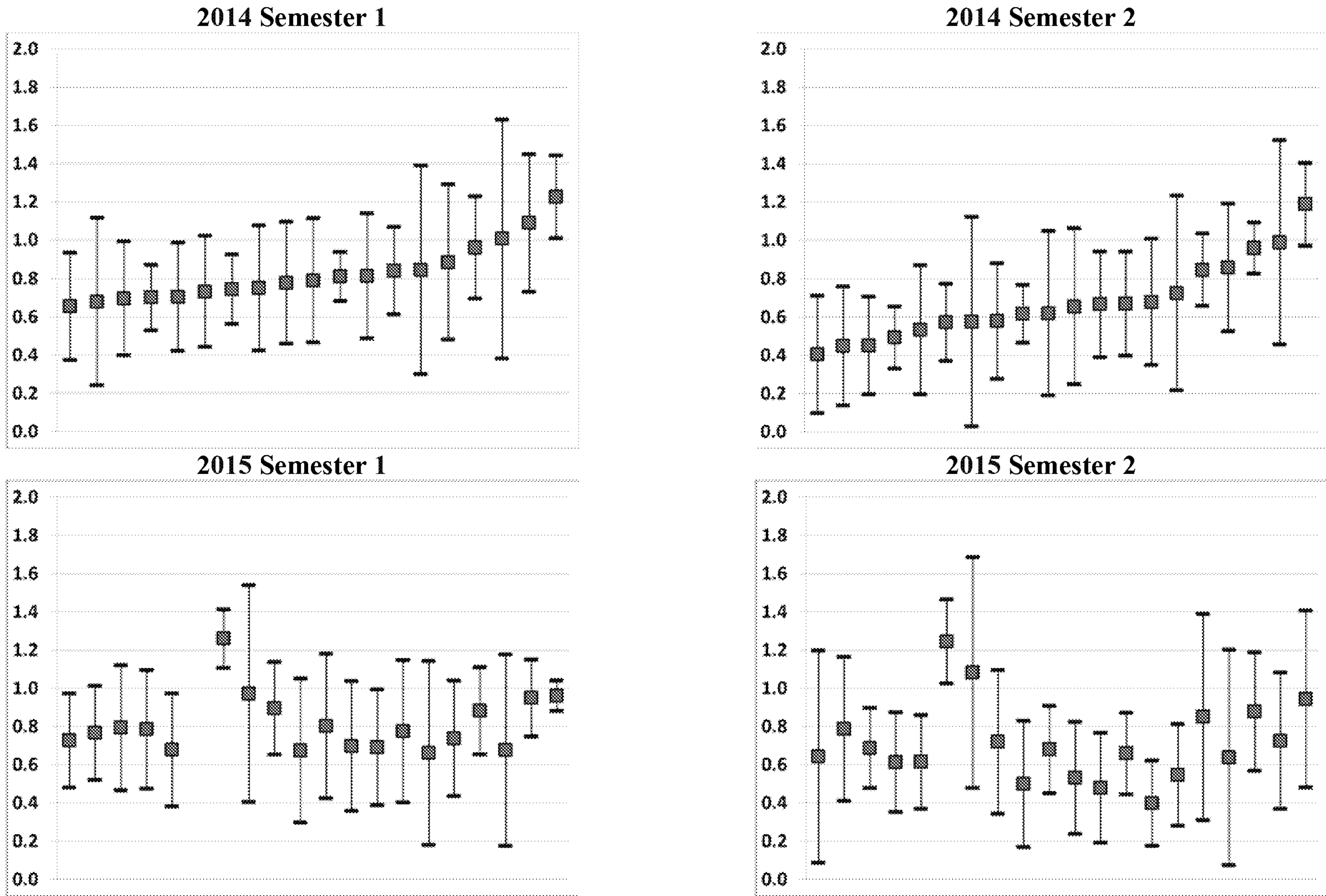
See notes in Figure 4.2.

Figure 4.4 Water System B: Comparison of total chlorine in mg/L at Total Coliform Rule sites



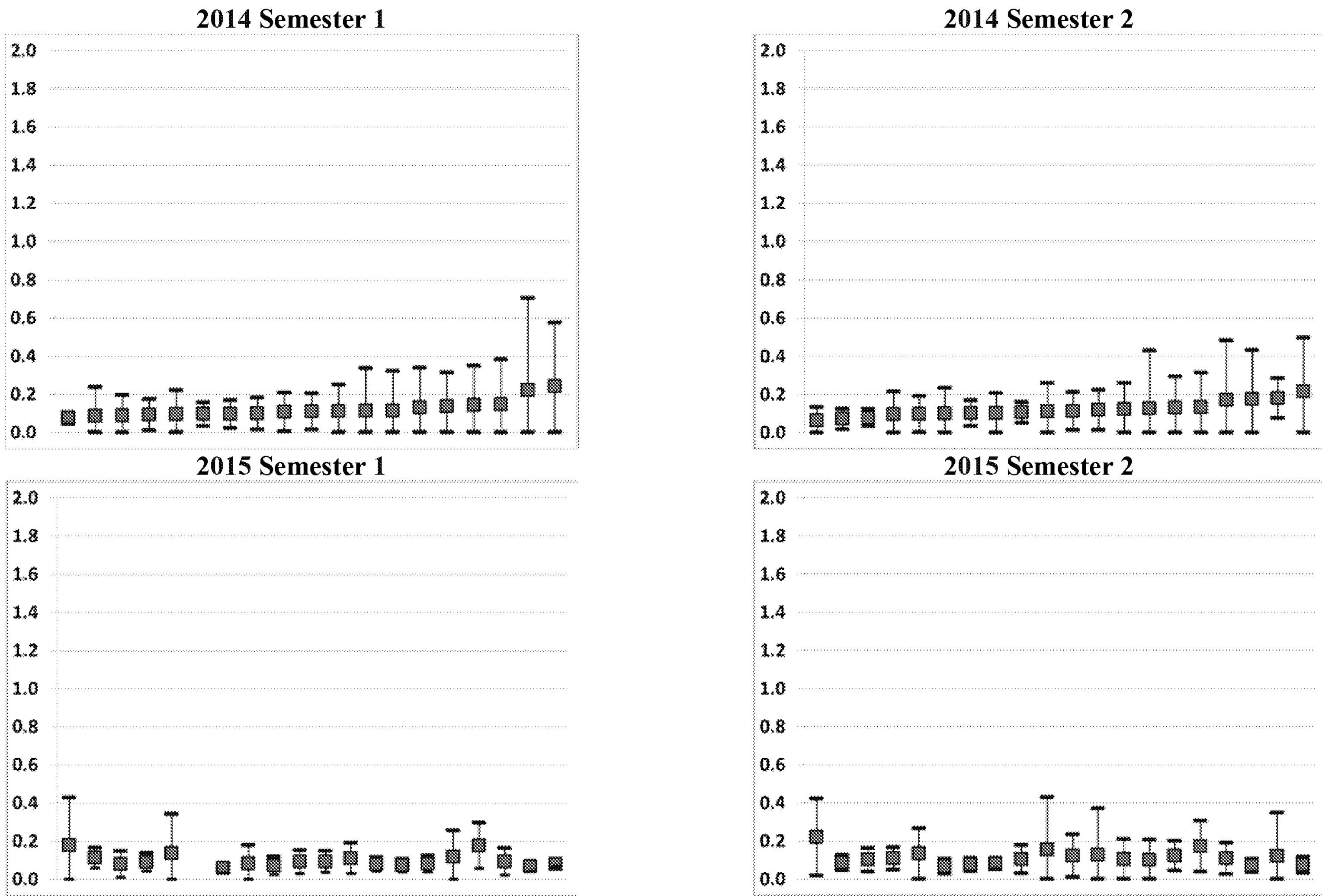
See notes in Figure 4.2.

Figure 4.5 Water System B: Comparison of turbidity in NTU at Total Coliform Rule sites



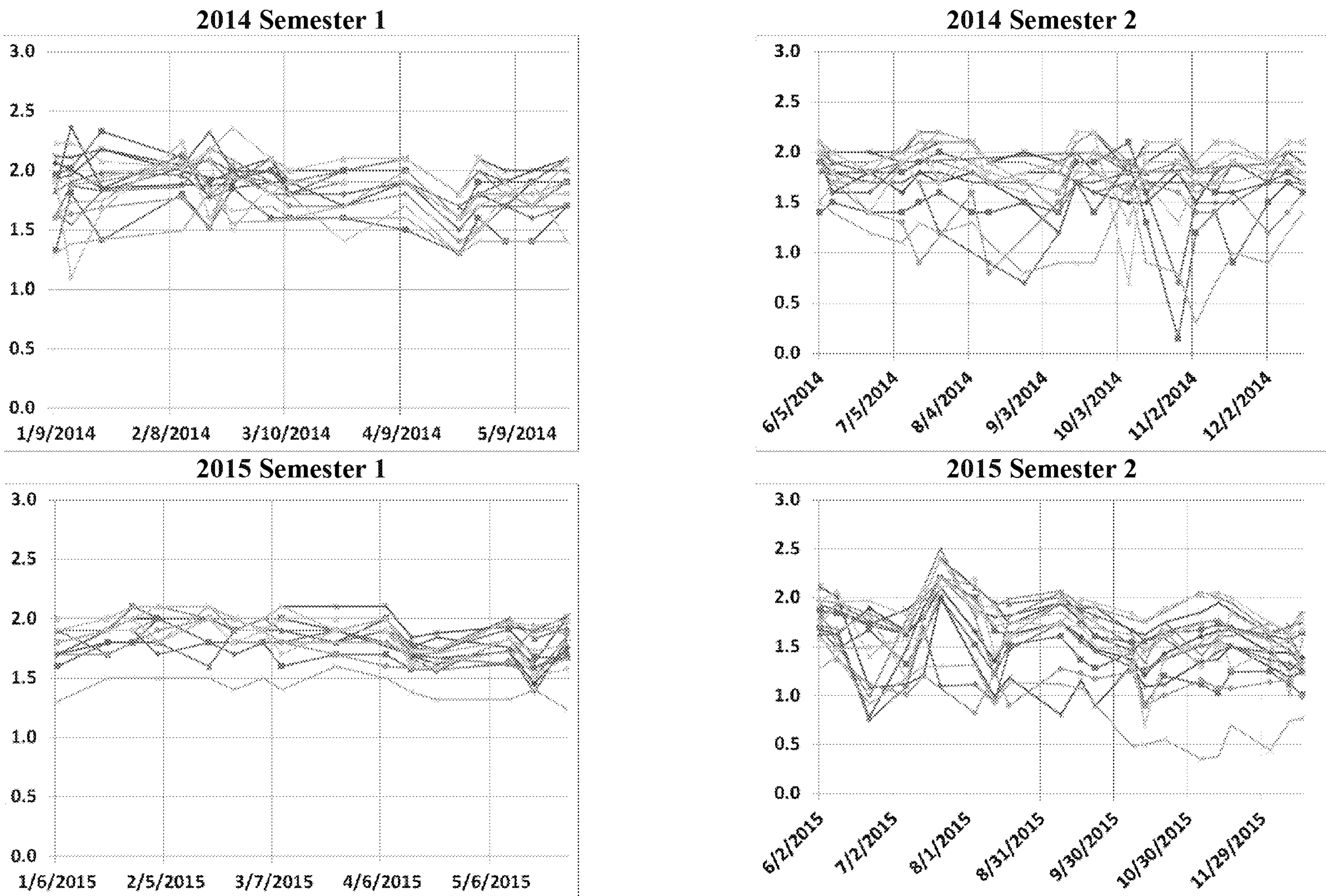
See notes in Figure 4.2.

Figure 4.6 Water System C: Comparison of total chlorine in mg/L at Total Coliform Rule sites



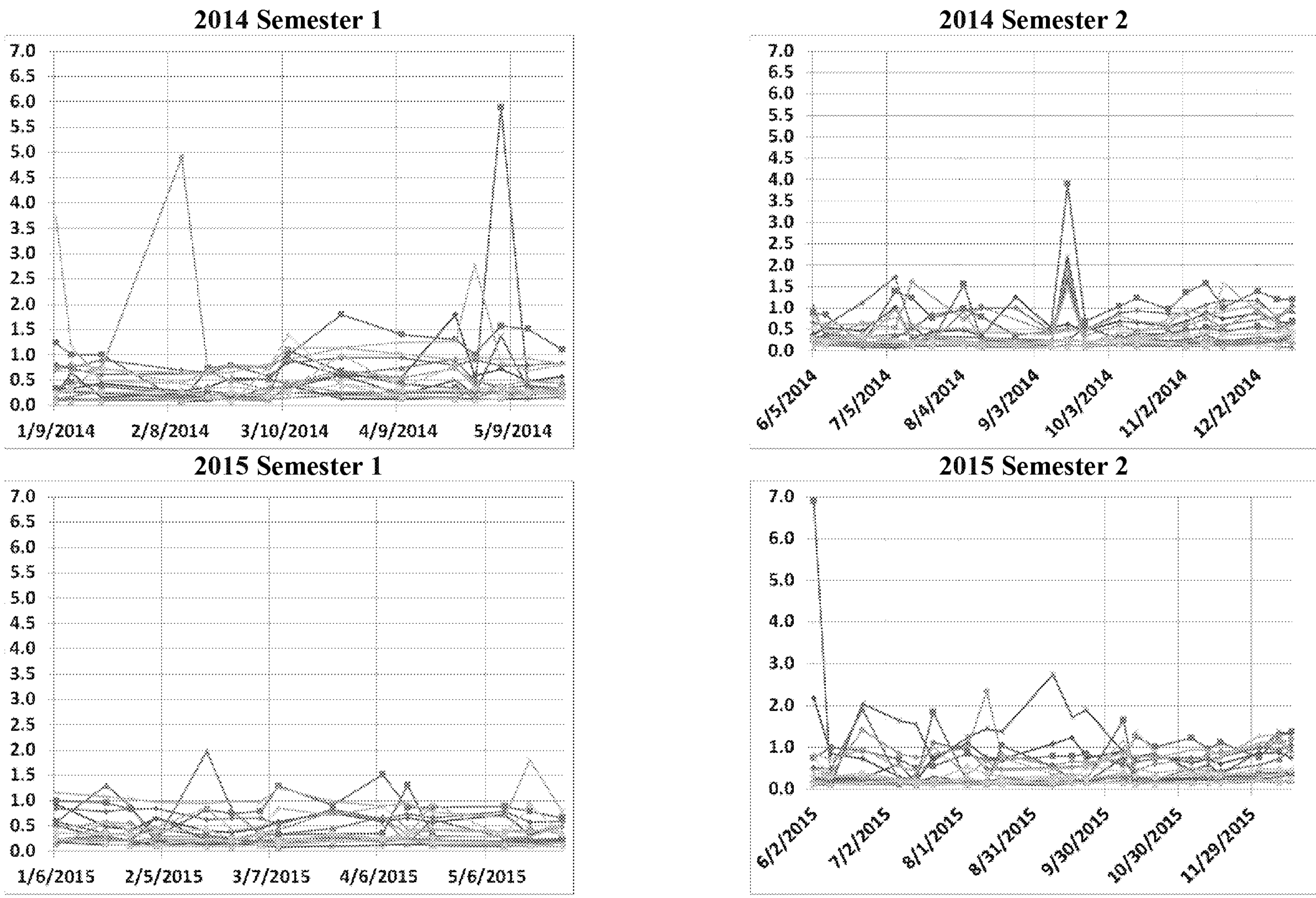
See notes in Figure 4.2.

Figure 4.7 Water System C: Comparison of turbidity in NTU at Total Coliform Rule sites



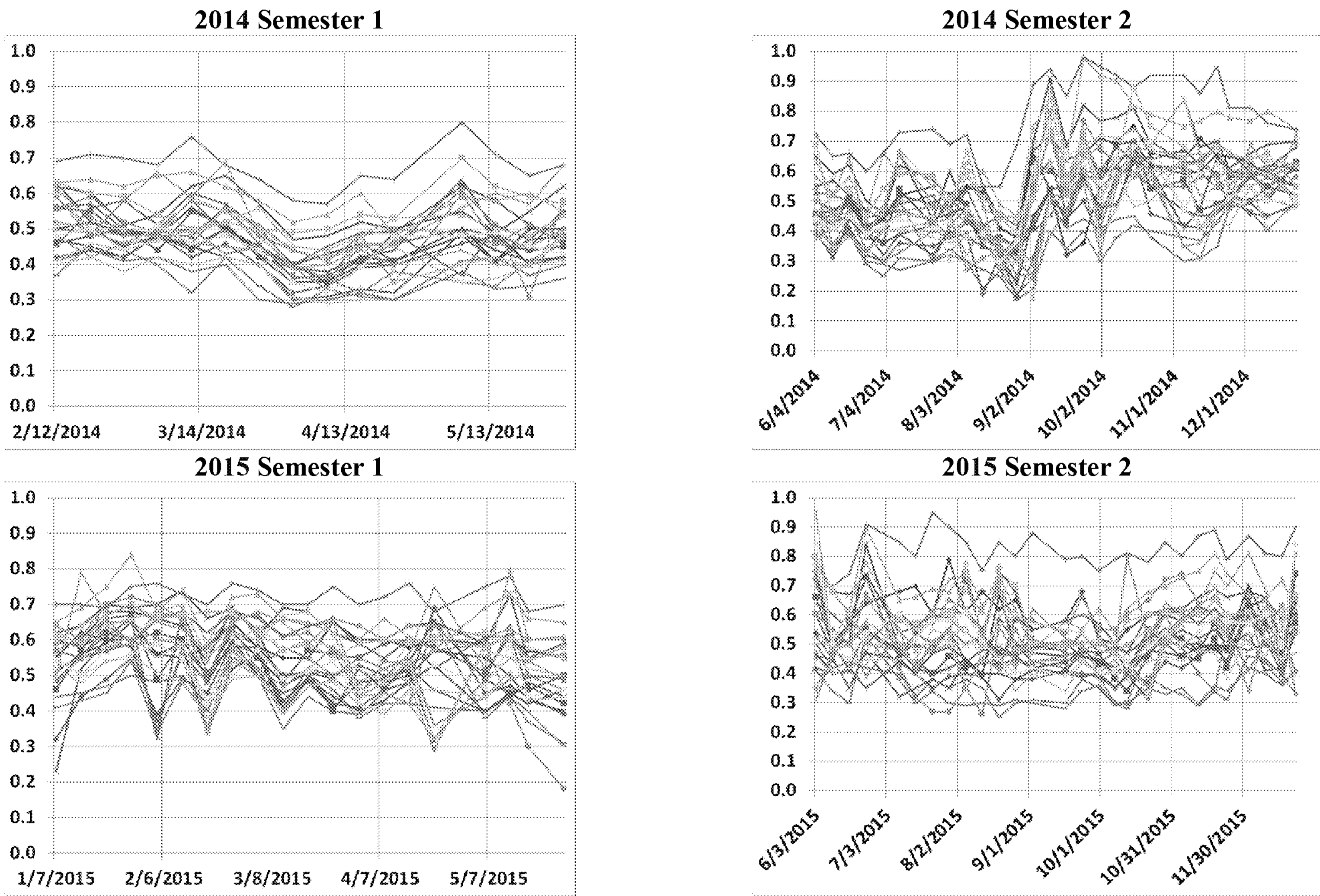
Each line represents data from a sampling site over time. Sampling sites are not identified here.
These graphs show whether or not there is overall conformity to the water quality trend in the water system.

Figure 4.8 Water System A: Comparison of total chlorine in mg/L at Total Coliform Rule sites over time



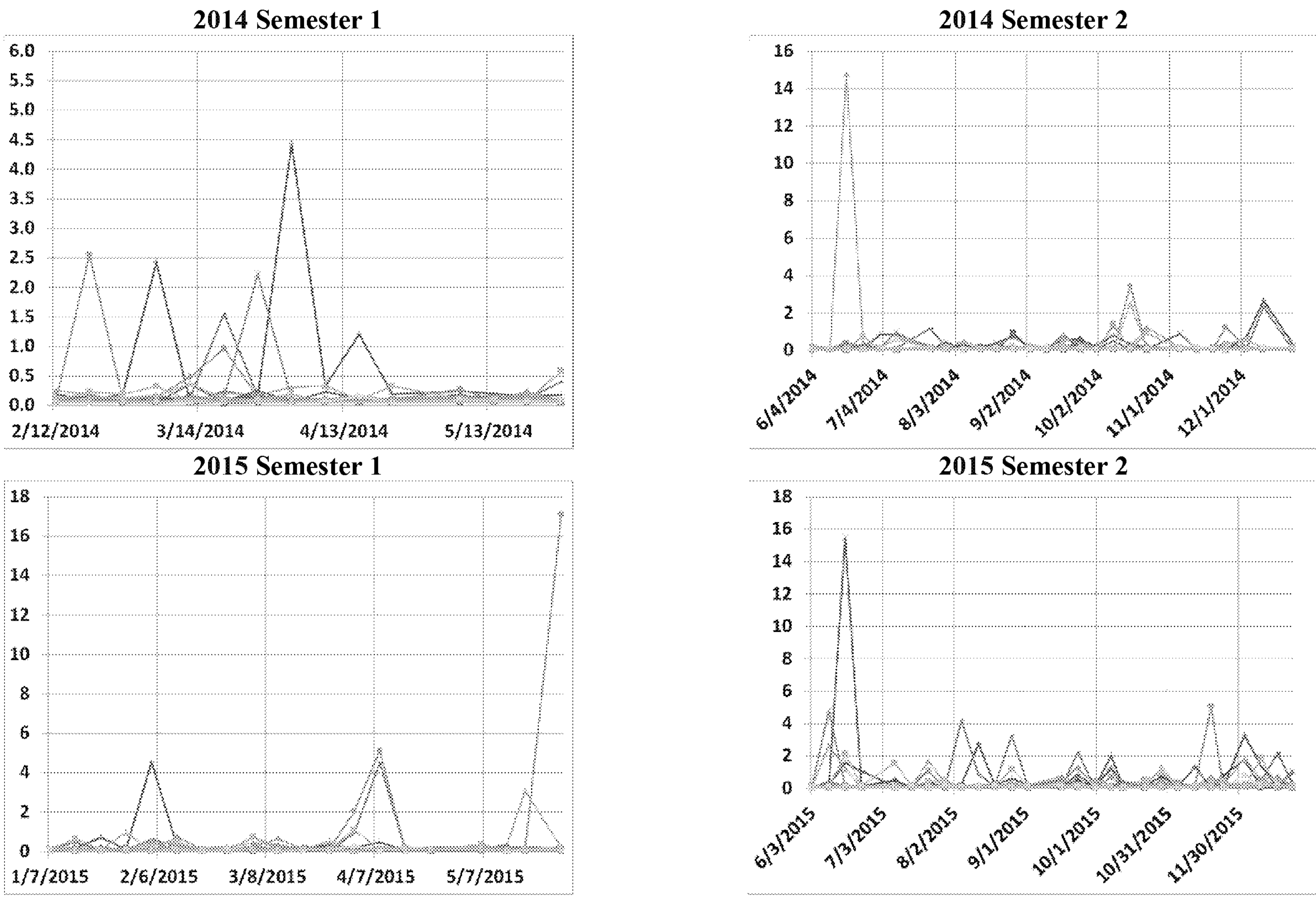
See notes in Figure 4.8.

Figure 4.9 Water System A: Comparison of turbidity in NTU at Total Coliform Rule sites over time



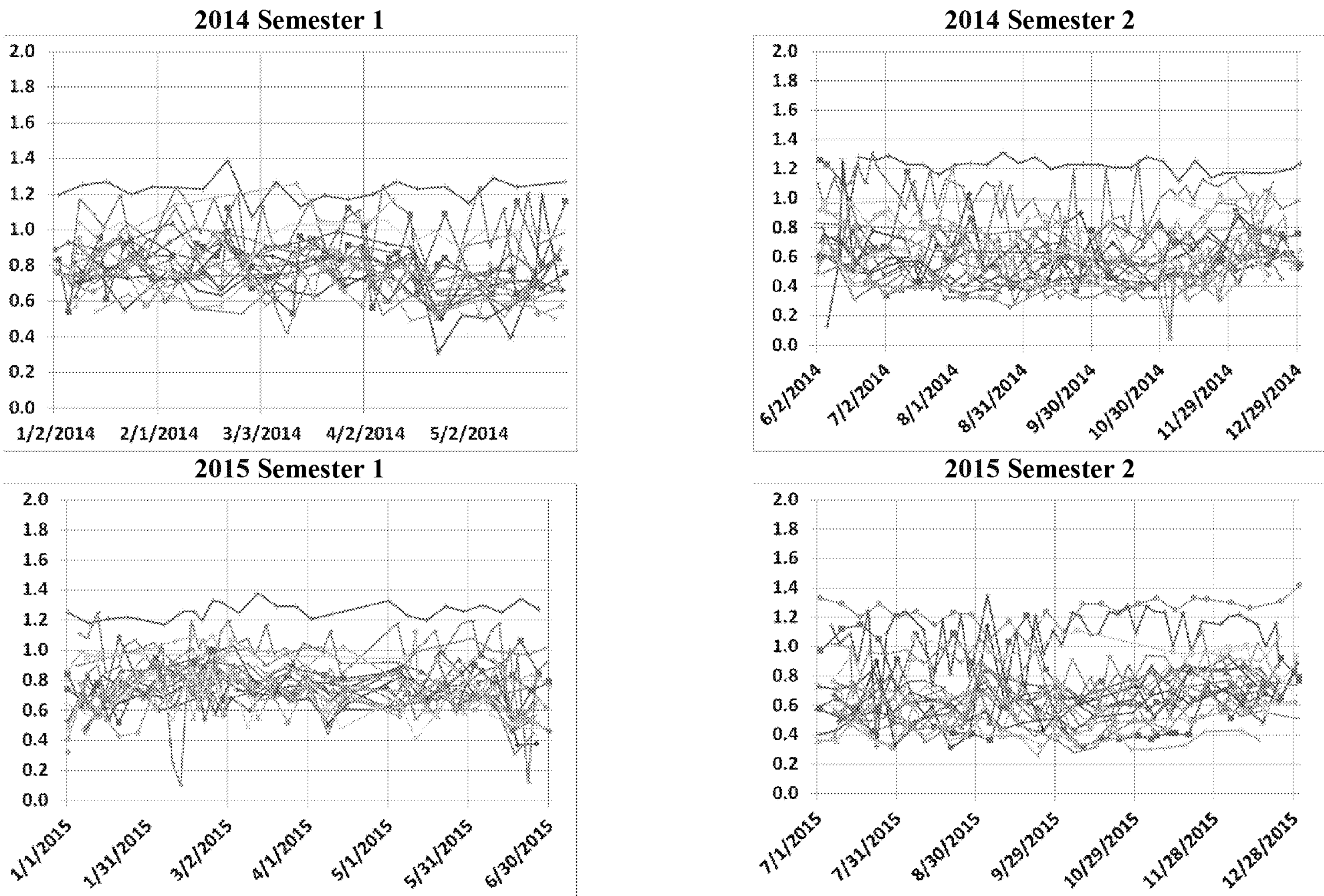
See notes in Figure 4.8.

Figure 4.10 Water System B: Comparison of total chlorine in mg/L at Total Coliform Rule sites over time



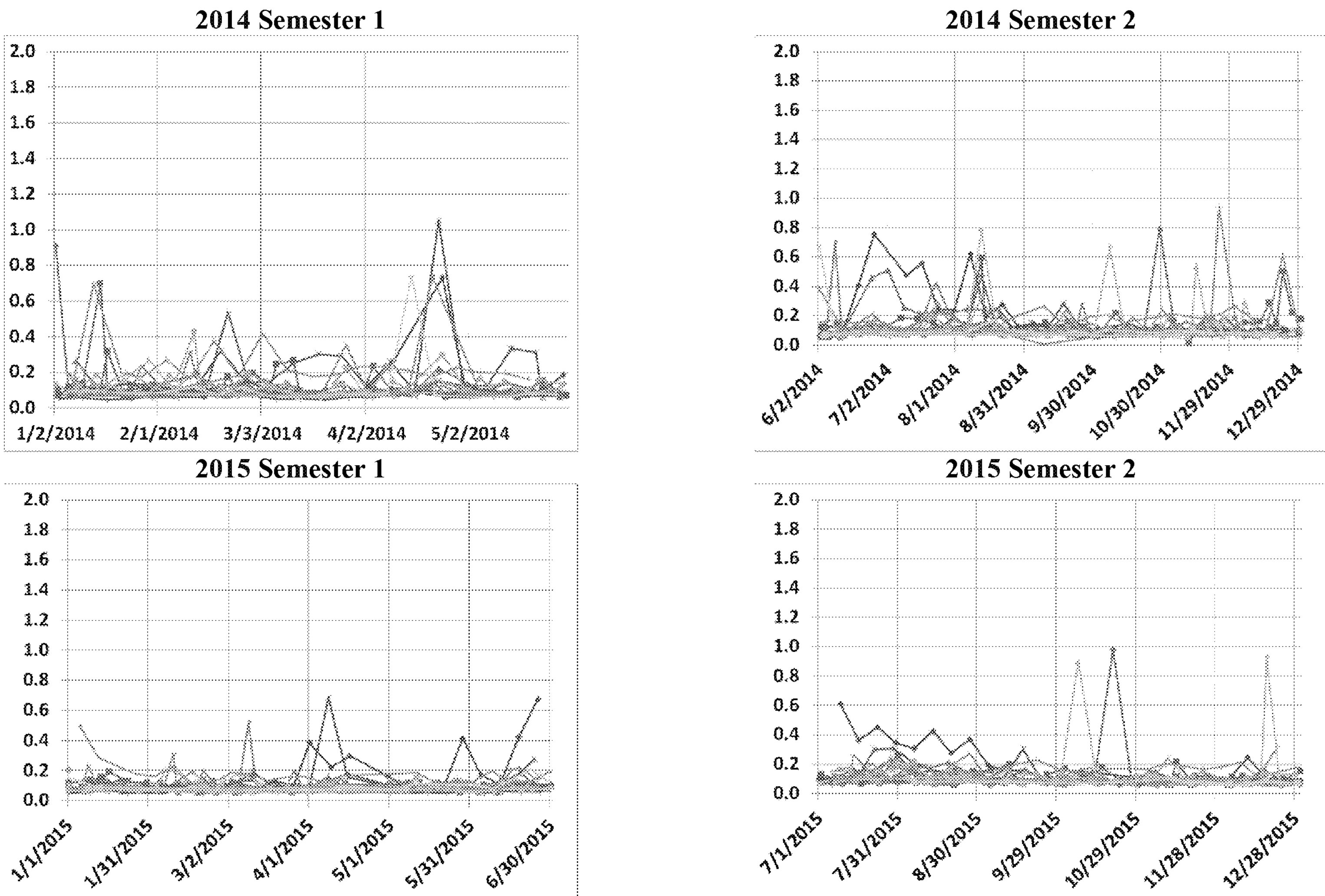
See notes in Figure 4.8.

Figure 4.11 Water System B: Comparison of turbidity in NTU at Total Coliform Rule sites over time



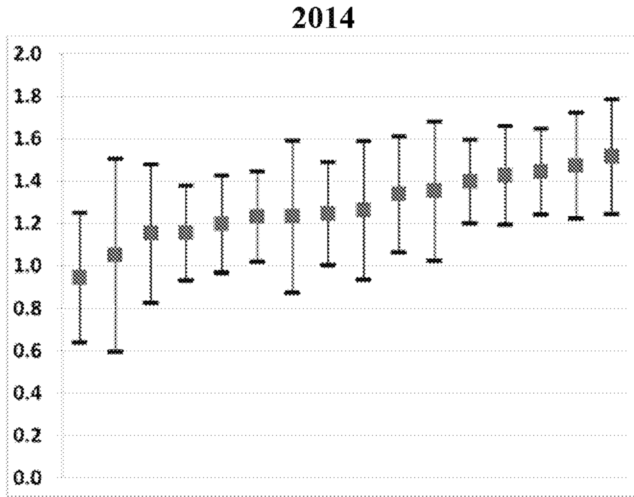
See notes in Figure 4.8.

Figure 4.12 Water System C: Comparison of total chlorine in mg/L at Total Coliform Rule sites over time



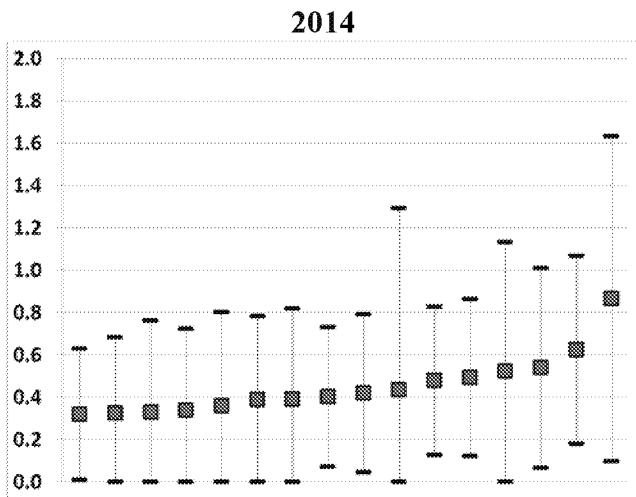
See notes in Figure 4.8.
In this system, there was a question about consistent sampling protocol where spikes may represent less flushing before taking the sample.

Figure 4.13 Water System C: Comparison of turbidity in NTU at Total Coliform Rule sites over time



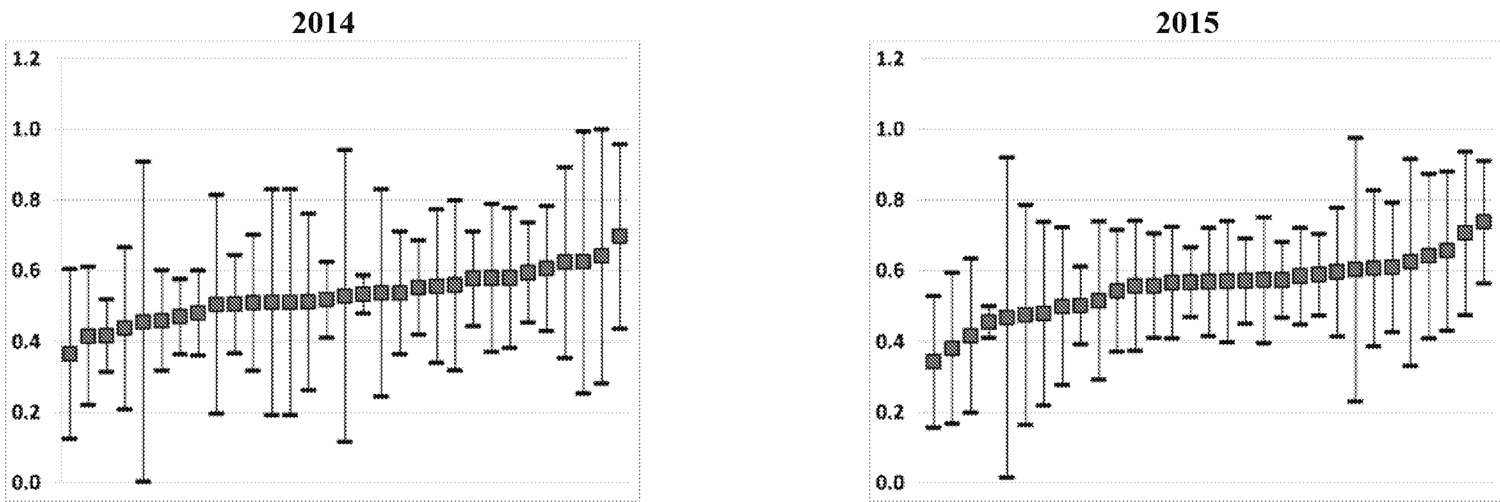
See notes in Figure 4.2.

Figure 4.14 Water System I: Comparison of total chlorine in mg/L at Total Coliform Rule sites



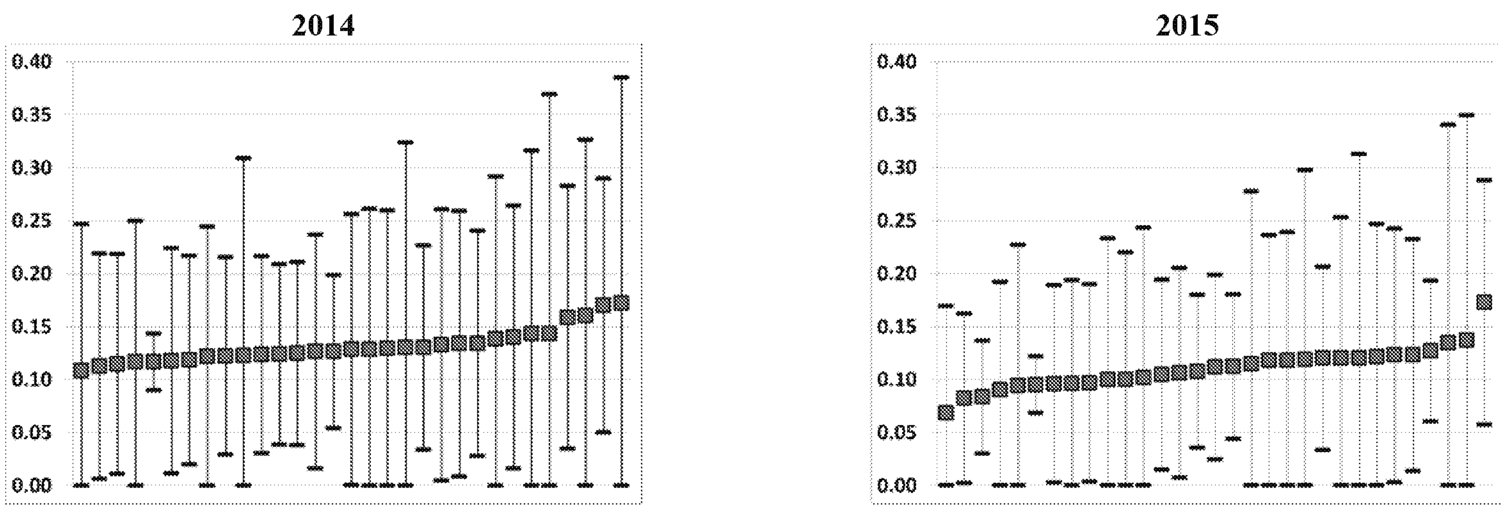
See notes in Figure 4.2.

Figure 4.15 Water System I: Comparison of turbidity in NTU at Total Coliform Rule sites



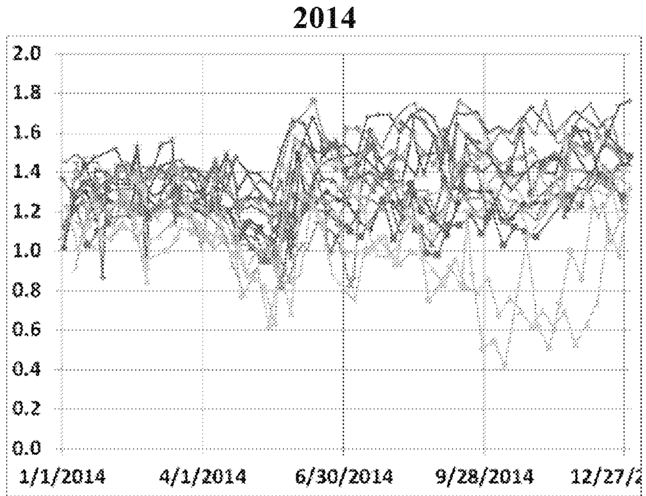
See notes in Figure 4.2.

Figure 4.16 Water System L: Comparison of total chlorine in mg/L at Total Coliform Rule sites



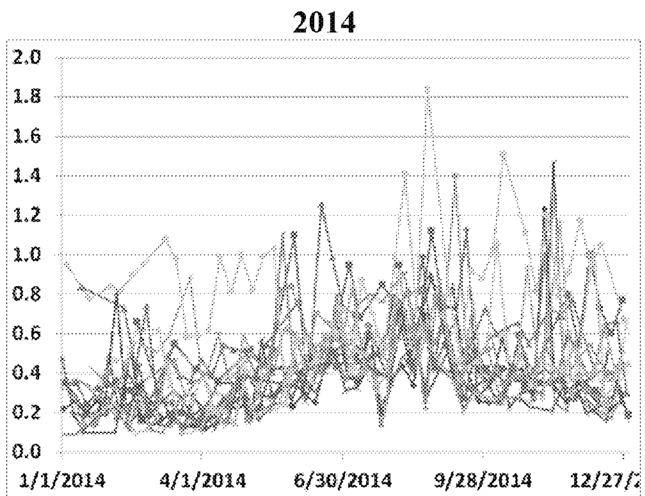
See notes in Figure 4.2.

Figure 4.17 Water System L: Comparison of turbidity in NTU at Total Coliform Rule sites



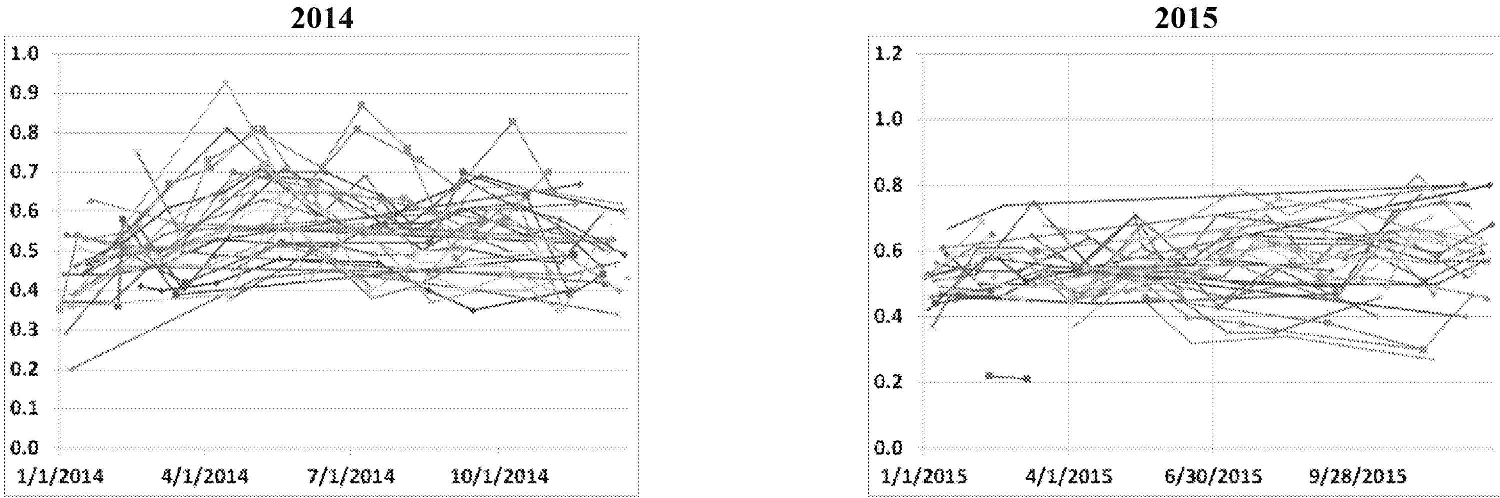
See notes in Figure 4.8.

Figure 4.18 Water System I: Comparison of total chlorine in mg/L at Total Coliform Rule sites



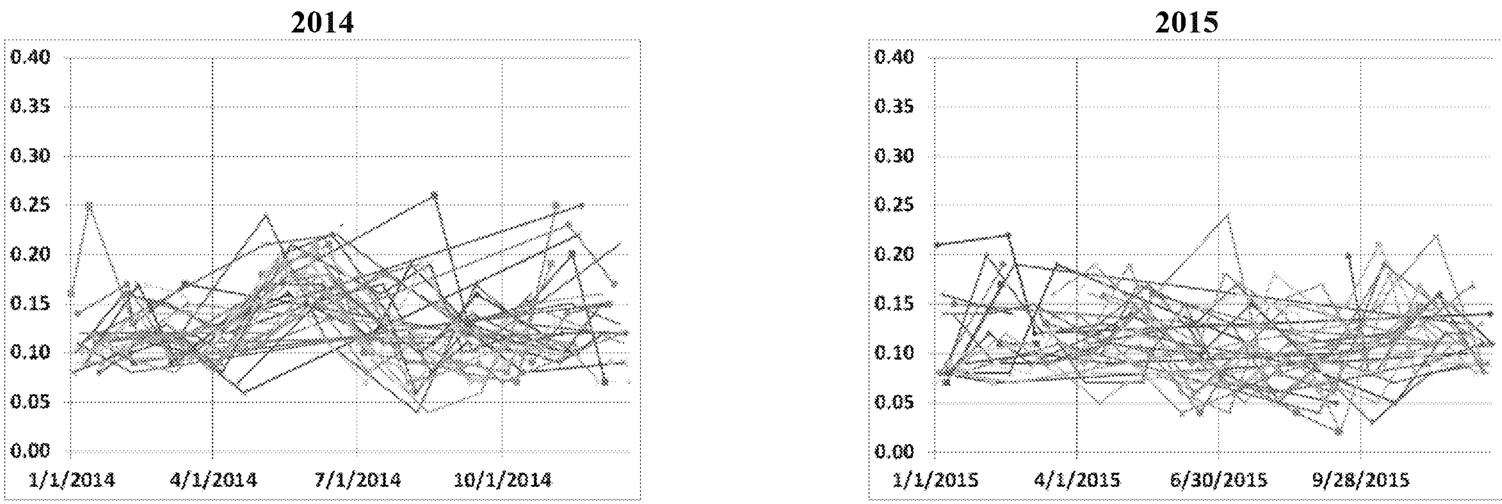
See notes in Figure 4.8.

Figure 4.19 Water System I: Comparison of turbidity in NTU at Total Coliform Rule sites over time



See notes in Figure 4.8.

Figure 4.20 Water System L: Comparison of total chlorine in mg/L at Total Coliform Rule sites over time



See notes in Figure 4.8.

Figure 4.21 Water System L: Comparison of turbidity in NTU at Total Coliform Rule sites over time

CHAPTER 5
DISTRIBUTION SYSTEM MONITORING TECHNIQUE

Now that the existing background information for the participating water utilities have been described in Chapters 2 to 4, the distribution system monitoring data gathered during this project will be discussed in Chapters 6 to 11.

This chapter describes how distribution system monitoring data were obtained and assessed.

DISTRIBUTION SYSTEM SAMPLING STRATEGIES

Sample Everywhere

Monitoring in a distribution system to assess a water system's potential for transferring lead and copper from metal components into the drinking water has always been fraught with dilemmas. Lead and copper release into the water varies over location in the distribution system and over time. Water utility personnel cannot visit every faucet in every building to sample and certainly cannot do that routinely.

Sample Critical Buildings

This is the reason that the EPA developed the strategy described for compliance sampling in the Lead and Copper Rule. Sampling sites are selected from residences most prone to have high lead levels such as the ones with lead service lines and ones with lead solder in copper piping. The number of sites for a utility is based on utility size. Compliance is based on comparing the 90^{th} percentile concentration in the sample dataset to a regulatory Action Level that triggers action to modify the water or the system in order to lower lead and copper levels.

While this is a satisfactory strategy, there are issues with the technique. As discussed in Chapter 3 on residential profile sampling, the technique may not capture the highest lead or copper levels in a building. Most importantly, it is very difficult for water utility personnel to enter buildings to obtain samples. Property owners also tire of the sampling regime. For this reason, sampling can only be performed infrequently.

As data for analysis, lead and copper data from various buildings in a water system are challenging. It is difficult to justify comparing metals concentrations from endless variations of piping configuration, water usage, and water flow scenarios.

Even with these drawbacks, lead and copper data from critical sites in a distribution system can add to an understanding of lead and copper release in a water system. In Chapter 2, Lead and Copper Rule first-draw stagnation compliance data from critical residences were used to pinpoint time periods when major changes in water quality may have corresponded with operational changes. In Chapter 3, stagnation profile sampling of residences with lead service lines gave insight into the lead and copper contributions of various piping materials and to the effectiveness of phosphate corrosion control chemicals at specific locations.

Sample a Network of Sites over the Distribution System

The third strategy is to sample a network of sites geographically scattered around the distribution system. However, entering private property at routine intervals and working with a variety of sampling scenarios are still issues with this strategy.

In Chapter 4, a network of sites was used by measuring two flowing water quality parameters as indicators of water quality status. It was not possible to collect lead and copper stagnation concentrations at those sites, but a general indication of debris and microbiological activity at those sites was possible. This made it possible to pinpoint areas of the distribution system that had higher potential for a water quality issue, including lead and copper release, to occur.

Sample for the Extreme Scenarios

Another strategy defines the best and worst water quality scenarios in a distribution system in order to define the minimum and maximum lead and copper release in a water system. With this strategy, the water quality characteristics of a distribution system can be bracketed between two extremes – between the characteristics of the freshest water and the characteristics of the oldest water, that is, the water that has resided in the water system the longest time.

On one extreme, the freshest water with the highest concentrations of treatment chemicals can be found at the entry points to the distribution system. The effectiveness of the treatment chemicals is assumed to be at a maximum at these points. (Some water systems have only one entry point to the water distribution system; this is common for a surface water system with one treatment facility. Other water systems, such as ground water systems with multiple wells, can have many entry points.)

The opposite extreme of water quality parameters to the entry point of a distribution system are locations of high water age in the distribution system. Water age is another term for residence time of water. High water age locations occur at the farthest reaches of a distribution system, at dead ends, and in areas of low water usage. As water age increases, both added and naturally-occurring chemicals in the water have more time to interact chemically and microbiologically.

Other severe conditions in water distribution systems can also be good strategic choices to contrast with fresh water sites. Some of these sites occur where different water qualities blend together. This would be the case in a system with multiple water sources, such as in systems with multiple wells or in systems where groundwater supplements a surface water source. At these locations, water quality varies with multiple sources. The water quality swings can cause destabilizing conditions to existing chemical equilibriums and to existing pipe wall scales. These swings, in turn, can impact corrosion and metals release.

Areas of high release of metals in a distribution system may also be related to the age of the buildings in a neighborhood and the types of plumbing materials prevalent at the time the neighborhood was constructed. An inventory of system piping materials and age may provide better insight into selection of monitoring locations.

Customer complaints of discolored water, bad taste, or bad odor can additionally identify locations in the distribution system where corrosion of metals along with other water quality issues may be occurring. Such locations, especially if geographical patterns of complaints are evident, should also be considered when selecting critical sampling sites for routine monitoring.

Combining Strategies

A combination of strategies can be used for the routine tracking of lead and copper release directly or indirectly. The strategies are:

- Capture water quality at a subset of critical buildings in the distribution system
- Capture water quality in a network of sampling sites around the distribution system
- Capture water quality at the extremes of the distribution system

The combination strategy was demonstrated for this project with residential profile sampling, tracking of disinfection concentration and turbidity at Total Coliform Rule distribution system compliance sampling sites, and the use of a special monitoring station located at a high water age location. The high water age location sampling will be discussed after describing more fundamental concepts of monitoring in distribution systems.

TYPES OF WATER SAMPLES

Batch Reactors

After a sampling site selection strategy has been chosen, it must be determined whether flowing water or stagnating water should be captured for analysis. To understand when each type of sample is used, consider the brewing of beer as a frame of reference. To make beer, fresh ingredients with known characteristics are poured into a vat and then allowed to undergo chemical and microbiological changes for a period of time. At the end of the reaction period, the final product is withdrawn and analyzed to determine if the desired characteristics have been achieved. The brewing of beer is a batch process and the vat that holds the ingredients during the process is called a batch reactor.

Water pipes are also batch reactors. Fresh water flows into the pipe. Chemical and microbiological interactions occur during the time that the water is in the pipe. The water in the pipe can be withdrawn after a reaction period and analyzed to determine the outcome of the reactions. Examples of reaction outcomes in water are concentrations of lead, copper, and other metals and population of microorganisms.

Consumers of water in a system do not typically receive water fresh from a well or treatment plant. They receive water after varying degrees of chemical and microbiological interactions have occurred in the piping of the water distribution system and in their buildings. Therefore, the batch reactor concept aids in studying the water quality that the consumer receives.

Stagnating Water Samples

Buildings

Buildings connected to water systems are batch reactors. Fresh water flows in from a water main and then undergoes changes based on piping materials, residence time in pipes and tanks, flowrates, and quantity of water used. The Lead and Copper Rule uses residences with lead service lines or lead solder as the batch reactors in its sampling strategy. The Rule prescribes a minimum of six hours of reaction time, that is, six hours of water stagnating in the piping.

Pipe Loops

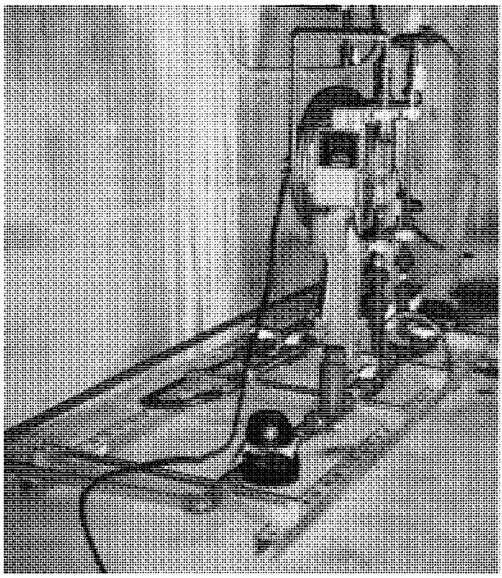
Given the problems already discussed with sampling from privately-owned buildings, an apparatus was devised to simulate a building piping system. It was called a "pipe loop apparatus" developed by the AWWA Research Foundation (AwwaRF, now renamed as the Water Research Foundation) in anticipation of the 1991 Lead and Copper Rule (EES 1990). The original apparatus consisted of one or more lengths of lead or copper pipe, each pipe able to hold at least one liter of water so that a one liter sample, similar to the Lead and Copper Rule residential compliance sample volume, could be obtained. The pipes were attached to non-reactive plastic pipe that connected to fresh distribution system water. Flow meters controlled the flow to each pipe. Water flowed from the distribution system, through the pipes and to waste, as occurs in building plumbing. The water flowing from the distribution system was controlled by a programmable timer opening and closing a valve to turn water on and off similar to the water usage pattern in a building.

The timer also allowed for a period of stagnation as described for reaction time in batch reactors. Because the Lead and Copper Rule calls for a minimum of six hours stagnation in residential plumbing before sampling, six hours became a common stagnation time used before sampling a pipe loop apparatus.

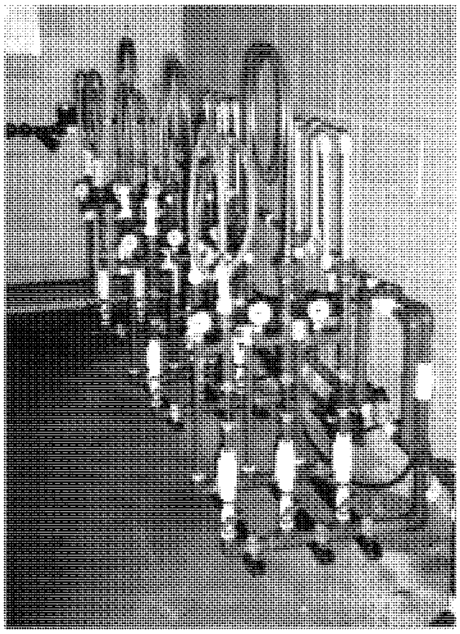
The original AwwaRF pipe loop apparatus was only used for corrosion control treatment chemical comparisons of entry point water; it was not used for routine monitoring of water quality at various locations around a distribution system. But even if it would have been used for distribution system monitoring, it would have been very awkward to place out in the water system because of its size.

Mini-Pipe Loops

Mini-pipe loops were developed to utilize the AwwaRF pipe loop concept as a means to monitor around a water distribution system (Cantor et al. 2000). They were originally constructed in 1996 at one-quarter the size of a standard pipe loop and skid-mounted. While the full-size apparatus might take up a large area at a water treatment plant, the mini-pipe loops were portable to about a 3 foot by 5 foot floor space in the distribution system. Copper mini-pipe loops were first used to place around a distribution system to monitor system water for effects of an added chemical (polyphosphate) that was thought to be increasing the copper levels in the water (Cantor et al. 2000). See Figure 5.1. This strategy successfully identified the chemical as the major influence of the copper problem and also identified when residences could be re-sampled to show lower copper concentrations after removal of the chemical. In 1999, mini-pipe loops were constructed for a research project to test the effects of chlorine addition on corrosion (Cantor et al. 2003a). See Figure 5.2. Three metals and three chemical treatments were studied using nine pipe loops. The complete apparatus fit into the corner of a small well house.



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 5.1 Mini-pipe loop used as a distribution system monitoring station in 1996



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 5.2 Mini-pipe loops of three metals for chemical treatment comparison in 1999

PRS Monitoring Stations

After the experiences with the mini-pipe loops, it became obvious that a distribution system monitoring station used as a routine gauge of water quality adds much insight into lead and copper and other metals release into water during routine water system operations and during system operational changes. Based on these experiences, criteria for an ideal distribution system monitoring station were developed. They were:

- Is relatively inexpensive
- Is easy to move from location to location
- Does not take up excessive space
- Is cushioned and isolated from vibrations that can interfere with pipe accumulation release
- Is straightforward to operate
- Can be used for either off-line chemical treatment comparison tests OR as a gauge of water quality around a distribution system
- Allows for routine collection of water samples
- Is easily accessible to water utility staff
- Has a uniform configuration
- Has uniform water flow rate and water usage
- Has a steady pressure
- Is capable of water stagnation for a uniform time
- Captures routine operation of the water system as well as treatment and operational changes that may occur over time
- Captures the interaction of pipe scales and films with the water
- Makes pipe film and scale analysis possible and economical so that the young scales developed during the monitoring period can be compared to older existing scales on actual water system pipe
- Does not destroy pipe film and scale during the metal sample preparation

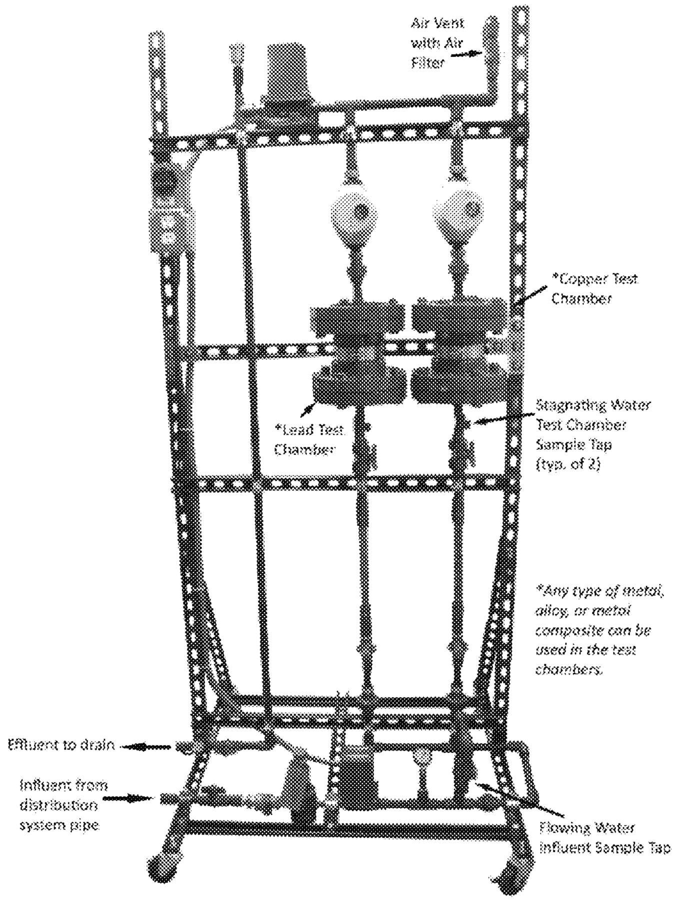
To meet these criteria, the mini-pipe loops were modified, in 2006, into the Process Research Solutions (PRS) Monitoring Station (Cantor 2009). See Figure 5.3. Instead of a piece of coiled pipe, stacks of metal plates that are secured in a section of larger plastic pipe are exposed to system water. The surface area of the metal plates to the volume of water held in the test chamber is similar to a 1.77-inch diameter pipe used as a pipe loop. This equivalent diameter pipe was the most economically and physically practical to achieve. See Figure 5.4 to view the metal plates stacked inside the test chambers before the chambers are sealed.

The PRS Monitoring Station is operated in the same way that standard or mini-pipe loops are operated. A timer controls the flow of water through the device as well as the time of stagnation. First-draw water samples are taken from the test chambers at the end of a prescribed stagnation period, collecting water that has been exposed to the metal surfaces.

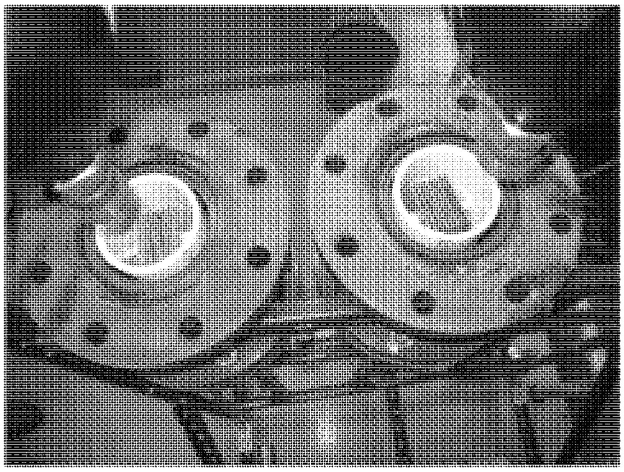
These stations were used in eight water systems in this project to track the response of lead and copper material to the system water over time. Each monitoring station was placed at a high water age location to gauge an extreme scenario of lead and copper release in each water system.

Flowing Water Samples

As in the beer-making analogy, the characteristics of the water flowing into the batch reactor are desired as well. With the PRS Monitoring Station test chambers acting as the "batch reactors" in this monitoring project, the associated flowing influent water samples characterized the "fresh ingredients" sent into the batch reactors. The samples were obtained from the influent sample tap on each monitoring station while water was flowing.



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 5.3 The PRS monitoring station, a standardized distribution system monitoring station



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 5.4 View of plates set inside and stacked in open test chambers in a PRS monitoring station

In addition, to contrast the high water age flowing water, flowing water samples from the entry points to the distribution systems were also obtained at the same frequency to characterize the "freshest" water in the system.

THE METAL SURFACE DILEMMA

In water distribution systems, all piping, whether in the distribution system or in the building piping, have varying degrees of existing chemical scales and biofilms that have built up over time. This is because all water is a complex solution of many naturally-occurring and added chemicals and a naturally-occurring potpourri of soil and air-borne microorganisms. Chemical scales precipitate onto the pipe walls over time; they are intertwined by biofilm development from microorganisms as the water environment allows. It is the interaction of the pipe wall debris with the adjacent water that shapes water quality, including lead and copper release.

To represent actual system pipes, the original AwwaRF pipe loop apparatus was intended to hold old lead pipes harvested from the distribution system and carrying decades of chemical scales and biofilms on their surfaces. This is good in theory; however, experimental dilemmas arose. When old pipes harvested from water distribution systems were used, there was no control over how representative each harvested pipe may or may not have been in the distribution system. In addition, metal particulates from the debris on the old pipe walls would be disturbed and interfere with the metal concentration data for a long period of time (AwwaRF and DVGW 1996).

Having new metal surfaces is equally problematic in that lead and copper transfer from the new metal surfaces is higher than after metal oxide and carbonate scales develop. The PRS Monitoring Station begins with new metal surfaces on the internal metal plates. The metal release from the plates is often high at first. To eliminate this unrepresentative data, monitoring of metal release in the test chambers typically is not begun until a month after the station is operating. Every water system is different as to how long it takes for lead and copper concentrations to stabilize.

However, an advantage of the PRS Monitoring Station over new metal in a pipe loop apparatus is that all the metal surfaces are in a configuration of a 2 inch by 2 inch by 1/16th inch thick metal plates. These metal squares are removed from the test chambers at the end of a monitoring project period and sent for both microbiological and chemical analysis. These are the same types of analyses performed on pipes harvested from distribution systems, but harvested pipes must be cut open in order to study their accumulations. The cutting operation can contaminate the surfaces to be studied. With the PRS Monitoring Station metal plates, they need no further processing before study. In this way, test chamber metal plates are studied and the chemical scales and biofilms are characterized. The metal plate scales have not had as much time to form as the scales on existing piping. When there have been opportunities to compare them with scales on existing piping, there are similarities but some of the compounds are farther away from their thermodynamically stable forms. The younger scales show the direction that the scales are heading and how fast they are aging. They also show similar extraneous elements and minerals as existing piping scales. And they show how phosphorus, when dosed into the water, is interacting with lead and copper.

To analyze the chemical scales on the metal plates, the scales are photographed and layers of scales visually identified. The following techniques are used to characterize the chemical scales on the metal surfaces:

- X-ray diffraction (XRD) determines the major compounds (minerals) on the metal surface

- X-ray fluorescence (XRF) or Energy Dispersive Spectroscopy (EDS) determines the bulk chemistry of the scale layers.
- Scanning electron microscopy (SEM) visually identifies crystal forms of compounds as well as detailed chemistry of a more localized area. The chemical composition found by SEM might not match that found by XRF/EDS because of the localized nature of the analysis.

The difference between these younger scales and mature scales that might exist in the distribution system are described by the scales' distance from the stable forms of lead and copper compounds as determined by a thermodynamic equilibrium state. Typical copper scales form in order of quick-forming and less stable compounds to slower-forming and more stable ones (closer to equilibrium). For cold water, cuprite (a type of copper oxide) forms first, then malachite (a copper carbonate) forms if alkalinity is high enough. Found mostly in hot water, tenorite (a copper oxide at a more stable higher oxidation state than cuprite) can form.

For lead scales, the succession is: litharge (a lead oxide), then lead carbonates such as cerrusite and hydrocerrusite, and then pyromorphite (a lead phosphate, if phosphate ions are available) and/or plattnerite (a lead oxide at a higher oxidation state if occurring).

Test chamber metal plates are studied microbiologically by means of submerging them in a lysing agent to release the biofilms. The cleaned metal plates are removed from the lysing agent and the final lysing solution analyzed for adenosine triphosphate (ATP), a measure of microbiological population. The result is reported in microbiological population per area of plate. This quantifies the degree to which biofilm has formed on the plates. It is especially informative in comparing the biofilm populations from plates of different metal types and different water systems. It is also informative in comparing the microbiological population in the water adjacent to the plates as a means to gauge the tendency of the microorganisms to stay on the plates in biofilms versus becoming entrained in the water.

With this chemical and microbiological knowledge of the scales and films developed during the monitoring period, factors shaping the water quality can be compared to the water quality data for more insight.

WATER QUALITY PARAMETERS

In flowing and stagnating water samples, various water quality parameters were measured based on a comprehensive strategy. That is, there can be many factors at work alone or simultaneously that cause the increase of lead or copper concentrations in the drinking water. Not knowing what nuances controlled the lead and copper concentrations in any given water system, quite a number of water quality parameters were measured in this project to determine if they either might influence the lead and copper concentrations or if they might be affected by the same factors controlling lead and copper.

The water quality parameters were organized into three main categories:

- Parameters involved in uniform corrosion of metals
- Parameters involved in the biostability of water
- Parameters involved in pipe wall scale formation or dissolution

Several water quality parameters can fall into more than one of these categories.

These categories were selected from studying accumulations on PRS Monitoring Station test chamber metal plates and also components in the test chamber stagnating water over the years where compounds appeared to fall into these three general categories. There is room to add any number of water quality parameters to these categories; using the categories to group water quality parameters is only an organizational method.

Regarding uniform corrosion of metals, several types of chemistry should be considered based on previous PRS Monitoring Station projects. Carbonate chemistry is the focus of the Lead and Copper Rule and must be studied in each water system. Chloride and sulfate appear to affect the dissolution of lead and copper and seem to have a complex chemistry. The chemistry of higher oxidation states must also be considered as it was discovered around 2002 that higher oxidation states can create a more stable lead compound that should not be overlooked (Lytle and Schock 2005). Phosphate chemistry is important because the Lead and Copper Rule relies heavily on the addition of phosphate to control lead and copper.

Regarding biostability, there is an accessible and affordable analysis available currently to track the population size of all microorganisms (with the exception of viruses) in a water system. That is the analysis for the energy molecule of living cells, adenosine triphosphate or ATP. The population size can be assessed in the context of concentrations of nutrients for encouraging growth of microorganisms – nitrogen, phosphorus, and carbon compounds. The population size can also be assessed in the context of disinfection concentration for eliminating microorganisms.

Regarding scale formation or dissolution, several metals in the water system were studied. Some metals can adsorb lead and copper, accumulate them on the surfaces of the metal scales or particulates, and eventually transport them through the water system to consumers' taps. Iron, manganese, and aluminum are known for this (Schock et al. 2014). There are plumbing related metals that indicate if other metals are also corroding in the water system: cadmium, chromium, cobalt, nickel, tin, and zinc. There are minerals related to the natural hardness or softening treatment of the water: calcium, magnesium, strontium, barium, potassium, and sodium. There are also other metals that occur naturally in the water that may be of interest to track, such as arsenic and vanadium. A panel of metals can be obtained from laboratories by means of a metals scan from an inductively coupled plasma mass spectrometer (ICP).

A measurement of any metal can be further fractionated into dissolved and particulate forms of that metal. To do this, a portion of a water sample must be filtered through a 0.45-micron filter (APHA et al. 1995). The metals analyzed in the unfiltered sample portion represent total metals concentrations. The metals analyzed in the filtered sample portion represent dissolved metals concentrations. Particulate metals equal total metals minus dissolved metals concentrations. Ideally, water samples should be field filtered immediately after obtaining the samples so that metals do not change from dissolved to particulate forms or vice versa or adhere to sample bottle walls (Cantor 2006). If this cannot occur, then lab filtration will have to suffice but with suspicion that metals may have changed form. The PRS Monitoring Station test chamber stagnation samples were field filtered using a new disposable syringe and syringe filter for each sample in all eight water utilities. The extra residential profile samples from two of the five participating water utilities were laboratory filtered.

General water quality parameters describing scale formation or dissolution are turbidity, the measurement of particulate solids entrained in the water, and conductivity, the measurement of dissolved solids in the water.

MONITORING FREQUENCY

The frequency of sampling should be based on the nature of a parameter's variation in a given water system. It is necessary to sample more frequently at first until the variation of a parameter is understood and an adequate frequency can be set.

Budget and labor availability for monitoring may force compromises in data-gathering frequency and number of parameters.

The frequency of monitoring parameters in this project was based on past experiences with PRS Monitoring Stations in a variety of water systems and within an affordable budget.

PROJECT #4586 MONITORING PLAN

Sampling Sites

The sampling strategy used in this project was to provide a combination of sampling sites, where possible. Residential profile sampling was performed in five of the water systems. Disinfection concentrations and turbidity at Total Coliform Rule sites were graphed where data were available.

PRS Monitoring Stations were installed in eight of the water systems, where Water System H utilized two stations, one for each campus served by the water system. For this monitoring, sites that were sampled are shown in Table 5.1.

Table 5.1
Sampling sites regarding the PRS monitoring station

Abbreviation	Description
EP	Flowing water at entry points to the distribution system
MS Inf	Flowing water at the influent sample tap of the PRS Monitoring Station; all of the stations in this project were located at high water age locations; this site represents flowing system water characteristics at a high water age location
MS Pb	Stagnating water in the lead test chamber
MS Cu	Stagnating water in the copper test chamber

In the campus water systems, there was access to the large buildings connected to the water distribution system. Because water system cleaning can release pipe wall accumulations into the drinking water and cause temporary water quality issues, the water quality in the buildings was tracked by measuring turbidity weekly at critical points in the building. Critical locations in buildings, especially large buildings, are shown in Table 5.2 based on past water quality investigations in building plumbing.

Table 5.2
Sampling sites regarding the building plumbing for turbidity measurements

Abbreviation	Description
EP	Entry point where water enters the building
Far CW	A cold water tap deep inside the building
Soft Out	Just after the water softener
HW Recirc	Hot water recirculation water near the water heater
Far HW	A hot water tap deep inside the building

All turbidity measurements made on flowing water from building plumbing

Water Quality Parameters

Water quality parameters measured in the project are listed under the three major categories of factors that can influence the release of lead and copper as discussed previously. They are listed in Table 5.3.

One laboratory was used in 2014 and 2015 for the metals analyses and then a second laboratory was used in 2016. The metals analyzed and their limits of detection (LOD) are shown in Table 5.4.

A portion of the stagnating metals samples from the PRS Monitoring Station test chambers were filtered in the field using new hand syringes and 0.45-micron nylon syringe filters for each sample.

Monitoring Frequency

The monitoring frequency of the water utilities using the PRS Monitoring Station in this project is shown in Table 5.5.

Monitoring Station Operating and Sampling Protocols

The operating and sampling protocols of the PRS Monitoring Station are paraphrased from the operations manual.

Preparation of the PRS Monitoring Station

After the monitoring station is set in location and attached to an influent water line and hosing is run from the station discharge to a drain, it is isolated from the water system and filled with a chlorine solution. This is to disinfect the station so that future water samples are not contaminated by microorganisms introduced during assembly, transport, and installation of the station. The chlorine solution is left in the station for 24 hours.

The next step is to prepare and install the metal plates in the test chambers.

Preparation of the Metal Plates for the Test Chambers

The PRS Monitoring Stations use stacks of metal plates installed in the test chambers to study trends in metal release into water. Each test chamber must have only one type of metal plate. For example, if it is desired to study lead and copper trends, one test chamber will hold 16 lead plates; the second test chamber will hold 16 copper plates.

Table 5.3
Water quality parameters related to categories of factors that shape water quality in distribution systems

Uniform Corrosion of Metals	Biostability	Scale Formation and Dissolution
Total Alkalinity	Adenosine Triphosphate (ATP) as a measure of microbiological population	Turbidity
pH	Free chlorine or monochloramine as the active disinfectant	Conductivity
Temperature	Total chlorine including the active disinfectant and the combined chlorine concentrations	Total, dissolved, and particulate concentrations of the following metals:
Conductivity	Dissolved organic carbon	Lead
Total Hardness	Ammonia nitrogen	Copper
Chloride	Nitrite/nitrate nitrogen	Iron
Sulfate	Total Phosphorus	Manganese
Total Phosphorus	Total alkalinity	Aluminum
Orthophosphate	pH	Cadmium
Oxidation/Reduction Potential (ORP)	Temperature	Chromium
	Oxidation/Reduction Potential (ORP)	Cobalt
		Nickel
		Tin
		Zinc
		Calcium
		Magnesium
		Barium
		Strontium
		Sodium
		Potassium
		Arsenic
		Vanadium

Table 5.4
Limits of detection for metals at two laboratories

Parameter	Units	Limit of Detection for 2014-2015 Lab	Limit of Detection for 2016 Lab	Public Health Standard	Aesthetic Standard	Lifetime Health Advisory Limit
Aluminum	µg/L	10	5	200		
Arsenic	µg/L	5.0	0.50	10		
Barium	µg/L		0.10			
Cadmium	µg/L	1.0	0.10	5		
Calcium	mg/L	0.1	0.15	No standard		
Chromium	µg/L	1.0	0.5	100		
Cobalt	µg/L	1.0	0.5	40		
Copper	µg/L	5.0	1.0	1300 (Action Level; non-enforceable goal)		
Hardness	mg/L as CaCO3	(calculated)	(calculated)	No standard		
Iron	mg/L	0.10	0.018		0.3	
Lead	µg/L	3.0	0.10	15 (Action Level)		
Magnesiu m	mg/L	0.10	0.15	No standard		
Manganese	µg/L	1.0	1.0	300	50	
Nickel	µg/L	2.0	0.50	100		
Potassium	mg/L	--	0.15			
Sodium	mg/L		0.15			
Strontium	µg/L	1.0	0.25			4000
Tin	µg/L	--	0.10			
Vanadium	µg/L	1	--	30		
Zinc	µg/L	5.0	5.0			

Note: Abrupt horizontal line changes on metals graphs are due to metals concentrations at the detection limit around 1/1/2016 when the laboratories were changed and the limits of detection from many metals also changed.

Table 5.5
Monitoring plan for project #4586 PRS monitoring stations

Frequency	Flowing Influent Field Tests (also run on the entry point water to the distribution system)	Flowing Influent Lab Tests	Test Chambers Lab Tests
Weekly	Flow meter totalizer readings, pH, temperature, ORP, turbidity, conductivity, total chlorine, free chlorine or monochloramine, orthophosphate, if relevant		
Bi-weekly		Total metals scan, ATP	Total metals scan, dissolved metals scan, ATP
Monthly		Total alkalinity, chloride, sulfate, DOC	
Bi-monthly		Total Phosphorus, Ammonia, Nitrite/nitrate	

Each metal plate is submerged for a short time in an organic acid detergent in order to clean off debris from the metal surface and to reduce any oxidized surface metal. Metal plates are then rinsed with deionized water and slipped onto the plastic rods that hold the metal plates in the test chambers. Plastic lock nuts secure 8 cleaned and rinsed plates separated by plastic spacers on a plastic rod. Two rods per test chamber are prepared in this way.

Installation of the Metal Plates into the Test Chambers

The rods with the plates are transported as soon as possible to the test chambers. The test chambers are drained of the disinfecting solution and opened from the top. The test chamber internals that hold the rods of plates are set in place along with the metal plates.

The test chambers are closed up. Fresh disinfecting solution is pumped into the monitoring station to clean out contamination from opening the test chambers for the installation of the plates. The disinfecting solution is held in the station and test chambers for 15 minutes.

The manual influent valve to the monitoring station is then opened and water from the water system is introduced into the monitoring station. The manual flow continues until disinfecting fluid is flushed out. Flow rates are set and checked for each test chamber at 0.5 gpm per test chamber at 30 psig unless it is necessary to set a lower operating pressure.

The water flow is turned off and the timer is programmed to operate one hour a day.

Operation of the Monitoring Station

The PRS Monitoring Station timer is set to allow flow through the station one hour a day at 30 psig and 0.5 gpm per test chamber.

The station is to be visited once a week where the recording of flow meter totalizer readings is of importance to document and insure that the flow rate and water usage is constant throughout the monitoring period. Flow rate is tweaked by means of a needle valve for each test chamber as informed by the totalizer readings.

Sampling the Monitoring Station

Ideally, flowing water samples should be taken during the automatic flow period from the influent valve to the monitoring station. The flow will turn off automatically as controlled by the timer. After six hours from when the flow has stopped, the operator returns to the monitoring station to take stagnation water samples from the test chambers.

Unfortunately, many water utility personnel cannot fit two visits to a monitoring station into their work day so an alternative sampling protocol is performed. In the alternative protocol, the operator visits the monitoring station six hours after the automatic flow has stopped. Totalizer readings are written down for the calculation of the average flow per day since the last visit. Then, the test chamber sample taps are wiped with alcohol to disinfect them and stagnation water samples are drawn from the test chambers. After taking the stagnation samples, the flow is turned on manually and the pressure checked. If needed, based on the totalizer readings, flow rates are reset or tweaked and confirmed with a timed test on flow as recorded by the totalizers. Flowing water samples are taken based on the monitoring plan from the alcohol-wiped influent sample tap to the monitoring station. The timer will then be set back to automatic operation, turning off the flow. Final totalizer readings are written down to start a new week of automatic operation.

Field analyses are performed on some of the flowing water samples as prescribed by the monitoring plan. If field filtration is to be performed on metals samples, a portion of each metals sample is filtered through a syringe and syringe filter into a separate sample bottle. Finally, water samples are labelled, packed, and sent to the laboratories for analysis.

Monitoring Schedules

Table 5.6 lists the periods of time that each water system operated the PRS Monitoring Stations and carried out the monitoring program.

Table 5.6
Monitoring periods for water systems using the PRS monitoring stations

Water System	Monitoring Station Startup Date	Monitoring Station Shut Down Date
A	07/21/14	01/05/16
B	03/31/14	01/05/16
C	07/13/14	01/05/16
D	04/30/14	09/05/16
E	04/16/14	10/05/15
F	08/26/14	06/13/16
G	09/30/14	[12/31/17]
H1	10/08/14	12/7/16
H2	10/08/14	12/7/16

DATA ANALYSIS

Data Management

Data from the PRS Monitoring Station and entry points to the distribution system were entered into spreadsheets and transferred and stored in a relational database by means of the data management software, My Monitoring Data®. This software is an interface between storing data in a Microsoft Access® database and pulling out specific data for analysis and reporting in a Microsoft Excel® spreadsheet. The software also keeps an accounting of last changes made to a data point and by whom. Any changes to data that have already been entered are also noted in a comment column associated with the data point. Data found invalid are not erased but are hidden from calculations, reporting, and graphing.

There were some conventions followed to keep data handling consistent. For example, when the laboratory reported no detection for a parameter, "nd" was entered into the computer for that data point instead of 0. When data were pulled out for data analysis, an entry of "nd" was automatically translated to the laboratory's limit of detection for that analysis. This is because the parameter was at or below the limit of detection; it cannot be said that the value was 0.

Several parameters were calculated and certain conventions had to be set:

- Particulate metal concentration = Total metal concentration – Dissolved metal concentration
    - If dissolved metal concentration > total metal concentration and dissolved metal concentration – total metal concentration < 10% x total metal concentration, then particulate metal concentration = 0.001 (limit of detection does not apply here since

it is a calculated value. Zeroes can cause problems with some data analyses; instead the particulate concentration was stated as very small)

- o If dissolved metal concentration > total metal concentration, total metal concentration > 1.0, and dissolved metal concentration – total metal concentration > 10% x total metal concentration, then particulate metal concentration and dissolved metal concentration were left null. Laboratories have been consulted over these situations but the situation typically cannot be traced and may also be a sampling or filtering issue with metal particulates contaminating the dissolved metal sample.

- Larson-Skold Index = (chloride + sulfate concentrations)/total alkalinity
- CSMR = chloride concentration/sulfate concentration

Time Series Graphs

Each water quality parameter was plotted over time with all sampling sites graphed together for comparison of results. See Figure 5.5.

Graphs included markings for seasonal quarters of the year as many water quality phenomena are related to water temperature changes.

Graphs also included date markings for special events that occurred in the water system during the monitoring data collection. For example, if a well was taken off-line, water mains flushed, or biofilm-removing chemical dosed into the water, those events were signified relative to the time axis by a number referring to a list of system events.

Shaded Area Graphs

Dissolved and particulate fractions of each metal were graphed together in shaded area graphs. These graphs are similar to bar graphs where the two fractions add up to the total metal concentration. Instead of bars, data points for the dissolved metal are connected by a smooth curve over time and those for particulate metal concentrations are connected to each other as well. The area between the two curves is shaded black giving a dramatic visual effect as to the degree of particulate metal in the water. See Figure 5.6.

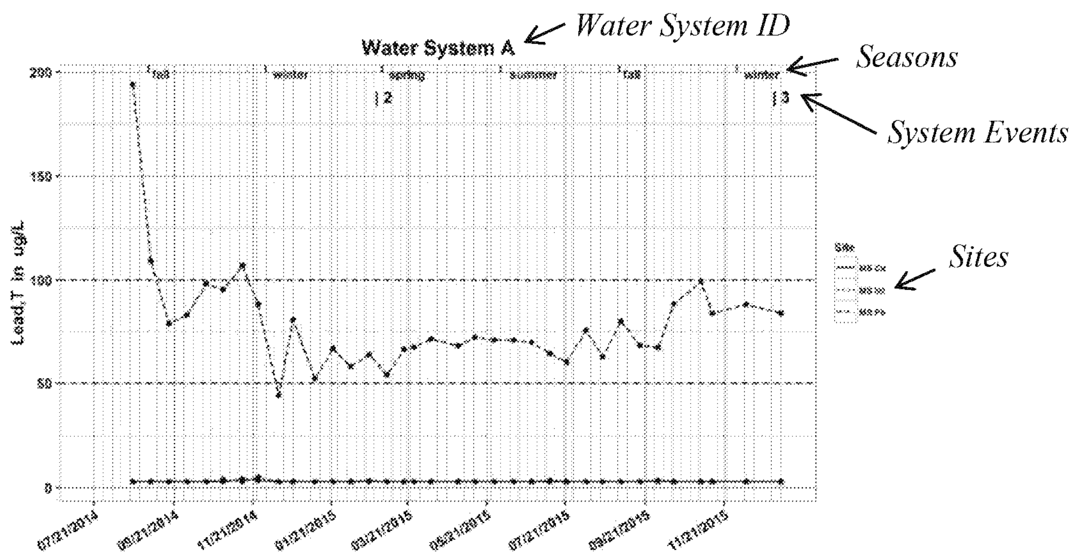


Figure 5.5 Example time-series graphs showing total lead concentration at three sites

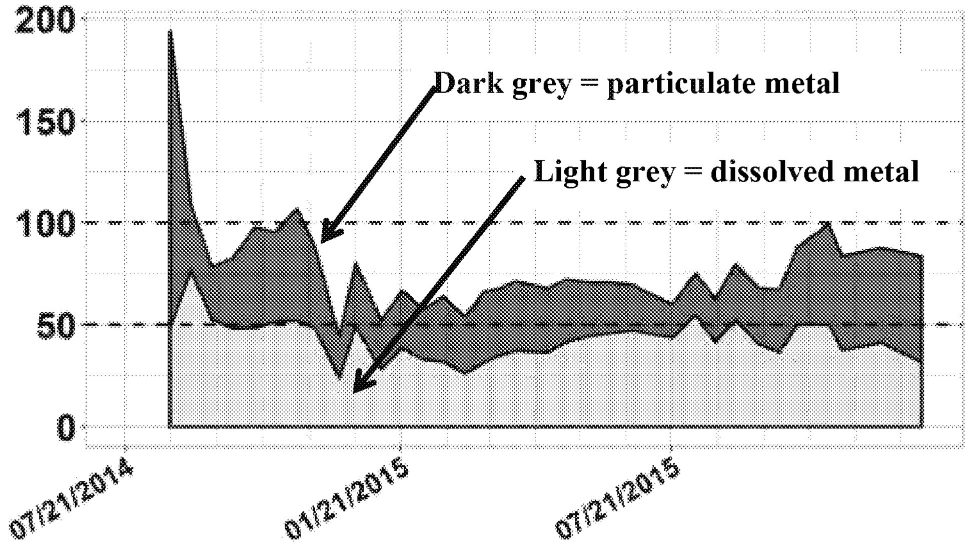


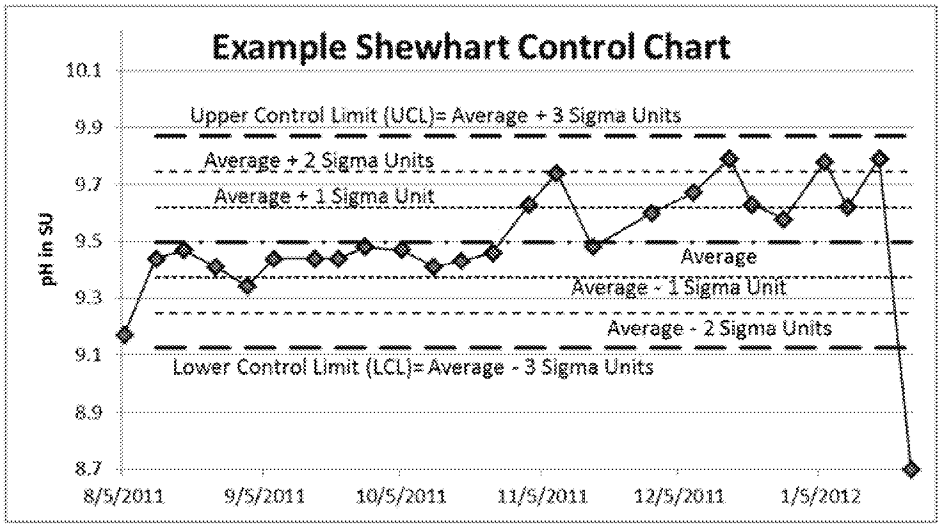
Figure 5.6 Example shaded area graph showing dissolved and particulate lead concentrations at a PRS monitoring station lead test chamber

Shewhart Control Charts

There is a method that can assist in determining which data points on a time-series plot are atypically high and which are atypically low. It can also identify other water quality trends indicating a changing water system. The method is to construct a Shewhart Control Chart. It is a data analytical technique that has been borrowed for water quality and water system data (Cantor and Cantor 2009; Cantor et al. 2012) from the field of industrial process control and improvement, called statistical process control. This technique was developed in the 1920's by Dr. Walter Shewhart of Bell Laboratories and was later integrated into many industries by Dr. W. Edwards Deming, a champion of process control and improvement (Wheeler and Chambers 1992).

The control chart is essentially a graph of data over time. Ease of interpreting the data is achieved by the guidelines plotted on the graph, which are plots of the Shewhart statistics calculated from the dataset. The statistics describe the expected variation of the data if the system remains operating under its existing conditions. Data points that fall outside of the lines of expected variation show that new factors are influencing the system. Other data patterns on the chart can show that changes to the status quo are beginning to occur (Wheeler and Chambers 1992).

Figure 5.7 summarizes the control chart's features. For Shewhart Control Charts, monitoring data are plotted over time. The average is drawn as a line through the data. A unit of variation, called a sigma unit, is calculated and then used to define the range (+/- 3 sigma units around the average) in which 99% of the data are expected to fall. Standard deviation is a type of a sigma unit. However, standard deviation can only be used on data from randomized experiments where each data point is independent of each other. In water quality monitoring, samples can only be taken sequentially over time like on an assembly line; the conditions at a previous sampling time might affect the conditions at the next sampling time. Therefore, the more general sigma unit is used. Refer to other references for a better understanding of the technique (Wheeler and Chambers 1992).



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.

Figure 5.7 Summary of Shewhart Control Chart characteristics

For Figure 5.7, the following are defined:

- Average + 3 sigma units = Upper Control Limit = UCL
- Average – 3 sigma units = Lower Control Limit = LCL
- Between the UCL and the LCL = the expected range of the data. This is the range that will result from routine factors working on the system and 99% of the data points are expected to fall.

Patterns of atypical data can be found on the graph when:

- Data fall outside the 3 sigma unit lines
- At least 2 out of 3 successive values fall on the same side of the average and are 2 sigma units or greater away from the average
- At least 4 out of 5 successive values fall on the same side of the average and are 1 sigma unit or greater away from the average
- 8 or more successive points fall on the same side of the average line

Any data following the above patterns should trigger an investigation of system operations to determine the cause. If results are unfavorable, then corrections can be made to system operations. If results are favorable, then the continuation of such operating conditions could be beneficial.

A Shewhart Control Chart prepared for this project is shown in Figure 5.8.

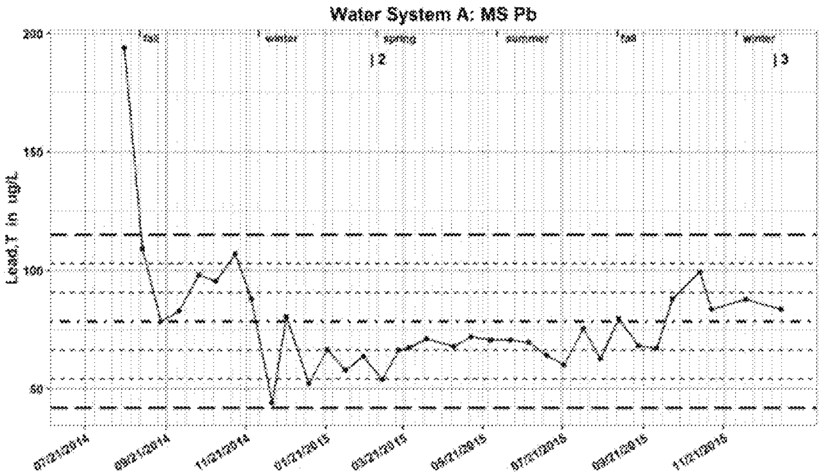


Figure 5.8 Total lead from Figure 5.5 at the lead test chamber graphed as a Shewhart Control Chart

In addition to the regular control chart, a second chart was drawn in this project to accentuate the data points that displayed trend patterns as defined by the Shewhart Control Chart rules. Refer to Figure 5.9.

The Shewhart Control Chart statistics were also used in this project to compare results between sites and between water systems. Besides the average, the "Upper Control Limit" (UCL) and the "Lower Control Limit" (LCL) were used for these comparisons. The UCL equals the average value plus 3 sigma units; the LCL equals the average value minus 3 sigma units. The difference between the UCL and the LCL is the range where 99% of the data points are expected to fall. Tables were made for each parameter listing the UCL, average, and LCL for each sampling site as shown in Table 5.7. "UCL" and "Highest Expected Value" and "LCL" and "Lowest Expected Value" were used as equivalent in meaning. The Highest Expected Value/UCL and the Lowest Expected Value/LCL should not be mistaken for the actual maximum and minimum results observed. Instead, these are statistical values as described previously.

Taking this comparison between sites a step further, these values were graphed as in Figure 5.10.

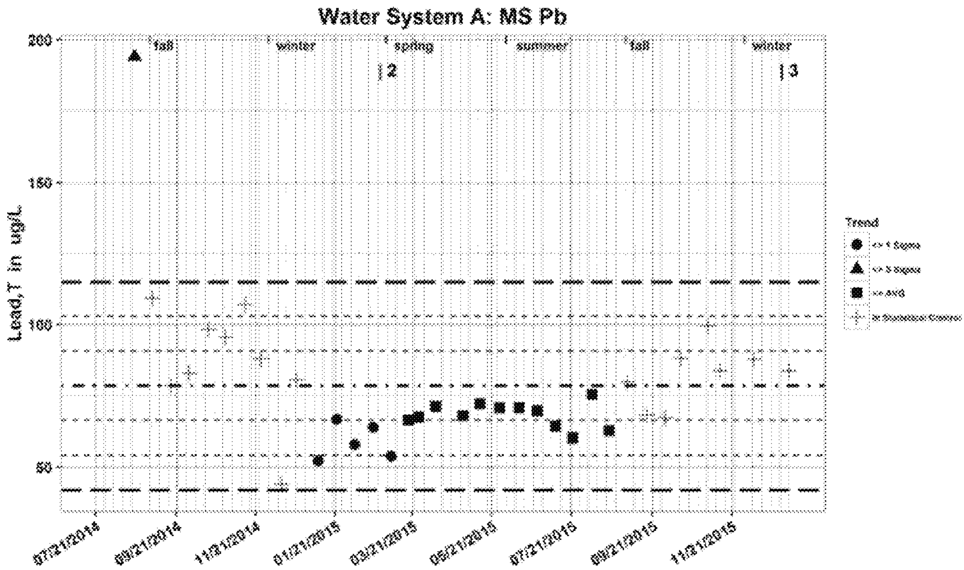


Figure 5.9 Figure 5.8 with data points highlighted for Shewhart Control Chart statistical status

Table 5.7
Shewhart Control Chart statistics summary of Figure 5.5

Lead, T: Comparison of Shewhart Control Chart Statistics by Site in µg/L			
Site	**UCL or Highest Expected Value**	**Average**	**LCL or Lowest Expected Value**
MS Cu	3.4	3.1	2.7
MS Inf	3.6	3.1	2.6
MS Pb	115.0	78.5	42.1

This is a table of the statistics representing average value and variation. This does not represent actual maximum and minimum results observed.

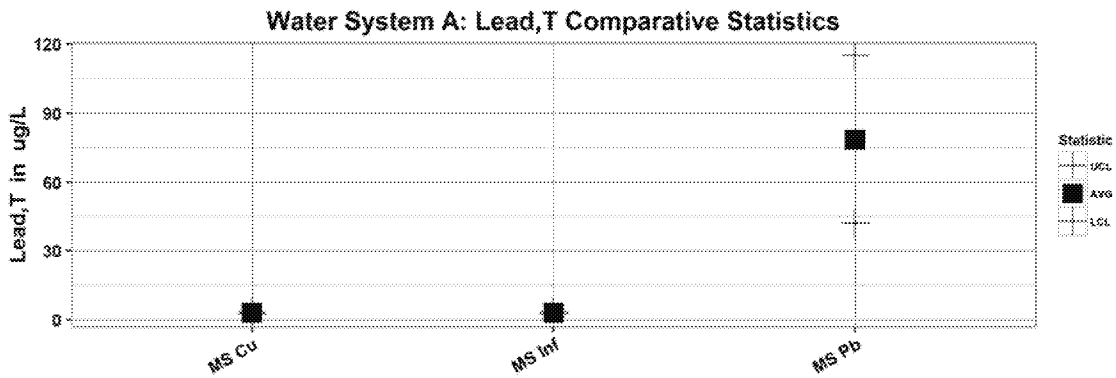


Figure 5.10 Graph of Table 5.7 Shewhart Control Chart statistics summary

Steady State Determination

In using the PRS Monitoring Station test chambers, or any other AwwaRF pipe-loop style apparatus, metals release data from new metal surfaces typically start at high concentrations because protective scales of metal oxides and carbonates have not yet been established on the clean metal surfaces newly in contact with system water. The dissolved metals concentrations fall over time as protective scales develop. Even though the scales do not have the time to develop to the degree that can be seen in the distribution system where pipe surfaces have been in contact with the water for decades, the metals' concentrations reach a smaller range of concentrations that can remain steady. Shewhart Control Charts of the dissolved metals release concentrations can be studied to determine where the concentrations have reached a point of "statistical control" and vary in a constant range.

An example is shown in Figure 5.11 where dissolved lead release is high and varies widely for several months. Figure 5.11(a) is the complete set of monitoring data from a lead test chamber on a Shewhart Control Chart. In Figure 5.11(b) data points in the Shewhart Control Chart that are in statistical control with each other are marked with a "+" symbol. The darker data points are atypical for this data set and represent the startup of a test chamber when protective scales are developing on clean metal surfaces.

When the initial data points are eliminated as in Figure 5.11(c), the Shewhart Control Chart shows all data points in what is considered statistical control with each other where rules of the control charts indicate no atypical trends are occurring.

Unfortunately, not all test chamber graphs fall so neatly into this exercise of pinpointing Shewhart Control Chart trends. Many times, the results of initial development of metal surface scales are confounded with water system events that can also influence the release of the metal under study. Many times, the selection of the steady state monitoring period is a subjective one based on knowledge of the system operations and events.

The steady state dissolved lead and copper concentrations are used in this study to compare to lead and copper release predicted by the EPA carbonate solubility models in Chapter 7.

Regression Trend Line

In Chapter 7, lead and copper release data are also compared to common corrosion indices to determine if the indices predict the degree that lead and copper will be released. The average steady state dissolved lead and copper concentrations are used as previously described. The indices used for comparison are dissolved inorganic carbon, calcium carbonate precipitation potential, the Langelier Index, the chloride to sulfate mass ratio, and the Larson-Skold Index. These are described in Chapter 7.

The metal concentration is plotted on the x-axis and the index is plotted on the y-axis. A linear regression line is fitted to the scatter of data points to determine if a metal concentration aligns with an index. If the data tend to form a linear relationship, the correlation coefficient, "r," will approach 1.0. If there is no tendency to form a linear relationship, r will approach 0.0. In the case of chloride to sulfate mass ratio, an exponential function had a higher correlation coefficient for the data point fit than did a linear function. In that case, an exponential line was used.

(a)

(b)

(c)

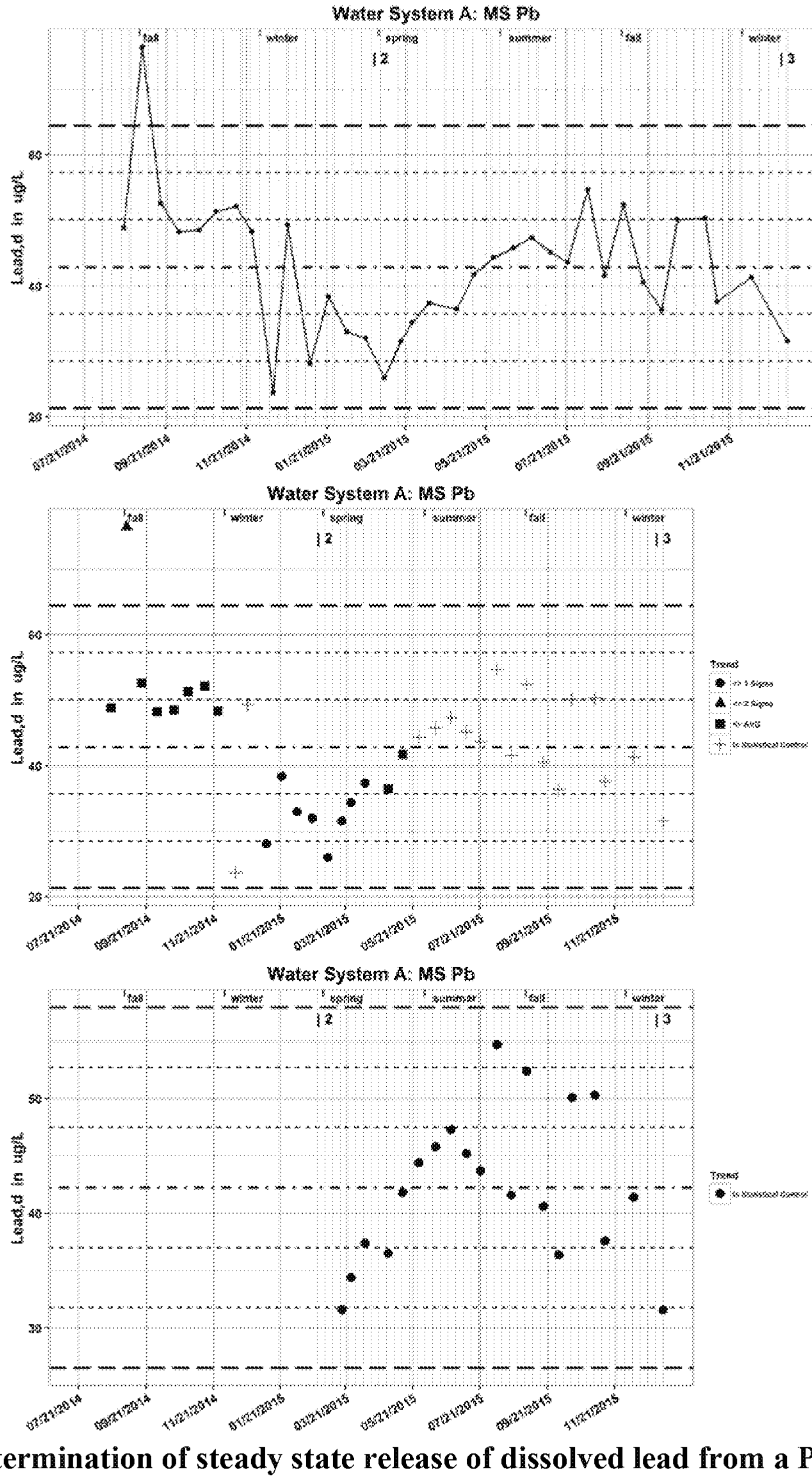


Figure 5.11 Determination of steady state release of dissolved lead from a PRS monitoring station lead test chamber

Correlations

Besides documenting the release of dissolved and particulate lead and copper in the PRS Monitoring Station test chambers, many other water quality parameters were analyzed as described previously. It was desired to determine which water quality parameters, if any, trended with the release of lead and copper. For this purpose, the Spearman Rank Correlation technique was utilized. This is appropriate for water quality monitoring data because the technique can be applied to "nonparametric" data. Water system data are nonparametric as described under the section, "Shewhart Control Charts," where one data point could influence a subsequent data point. The data are not considered independent and random.

The Spearman correlation is a technique that determines if two parameters are always increasing at the same time. If they are always increasing at the same time, they would have a perfect Spearman correlation coefficient of 1.0. If they increase together most of the time, they have a coefficient of a fraction of 1 and can range down to 0. The correlation also can discern if one parameter always increases while the other always decreases. If they always do this, they have a coefficient of -1. Fewer occurrences together would give negative fractions between -1 and 0. In this study, only coefficients between 0.6 and 1.0 and -0.6 and -1.0, the stronger trends, are acknowledged.

Conclusions drawn from the Spearman correlation coefficients should be made carefully. Common trends between two parameters do not prove causation. The two parameters may, instead, be characteristics of some other phenomena. For example, if lead release is trending with alkalinity of water, one should not assume that the lead release is the result of the increasing alkalinity. Instead, for example, an operational change of source water may be the real factor that increases both the alkalinity and the lead release. There can be many possible explanations that require more system study to decipher.

Time-aligned graphs of water quality parameters should also be inspected along with the correlation results. Sparklines are useful in this case. They are graphs without x and y axis labels that show the shape of the line connecting the data and the general trends of the data. When sparklines are created with data of multiple parameters over the same time period, they can be compared against each other to determine if trends are similar. Figure 5.12 is an example of sparklines that display two water quality parameters trending inversely with each other.

There are other reasons to inspect sparklines and other graphs instead of fully depending on Spearman Rank correlation coefficients. A trend pattern of one water quality parameter may be repeated in another water quality parameter at a later time period. Or, two water quality parameters may trend together only during a specific time period and trend oppositely or not at all in a different time period. These subtleties would be missed with a calculated correlation coefficient.

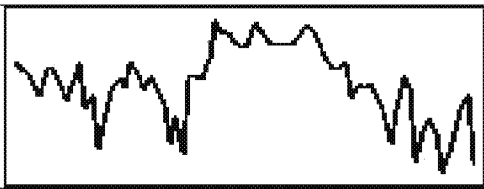
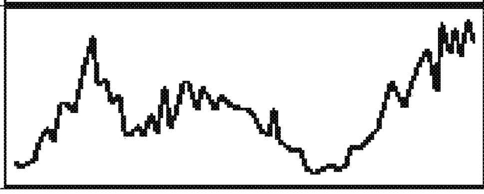
pH		
Turbidity		

Figure 5.12 Example of sparklines for data trend comparison

When studying the correlations in the PRS Monitoring Station data, flowing fresh influent water quality characteristics were compared to stagnating water quality characteristics. The correlations have been separated into:

- Correlations occurring within the flowing system water
- Correlations between flowing influent system water characteristics and resultant interactions that occurred in the stagnating test chamber water
- Correlations between water quality parameters that were released or changed together during the stagnation period in the test chamber

Box and Whisker Plots

Box and whisker plots, as shown in Figure 5.13, show how a set of data is distributed between the highest and lowest data point values. The data points are divided into four groups (quartiles). The grey box in Figure 5.13 encompasses the two inner groups with the black dividing line denoting the median (50^{th} percentile) of the data set. The highest group includes values between the top of the grey box and the top of the "whisker," the vertical black line with a short, horizontal line as the maximum data point value. The lowest group includes values between the bottom of the grey box and the bottom of the "whisker." For the minimum data point value at the bottom of the whisker, the short horizontal line in Figure 5.13 is at 0.

The diamond shape locates the average value of all the data points. The black triangle locates the 90^{th} percentile of all the data points. These plots were used on Lead and Copper Rule datasets in Chapter 11. All lead and copper concentration units in Chapter 11 on box and whisker plots are in units of µg/L.

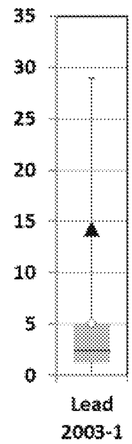


Figure 5.13 Example box and whisker plot for a set of Lead and Copper Rule data

Quality Control of Field Analysis Data

The analysis of water quality parameters must undergo quality control to assure accuracy and precision of the results. Water samples were sent to drinking-water certified laboratories where the analyses are subject to quality control techniques.

A number of water analyses were performed in the field. This was necessary because certain water quality parameters can change quickly from the time of sampling and with interaction with the air. Field tests used in this project were pH, temperature, total chlorine concentration, free chlorine or monochloramine concentration, conductivity, oxidation/reduction potential (ORP), and turbidity. For water systems adding a phosphate treatment product, orthophosphate concentration was analyzed in the field as a convenience.

Typically, no quality controls are run on field analyses. That is a shortcoming because the accuracy and precision of any test cannot be assumed. In this project, similar quality control techniques used in water laboratories were used on field analyses (APHA et al. 1995). For accuracy, a standard solution, where possible, was measured every week to determine how close the measurement came to the known value. Percent recovery of the standard was calculated as:

$$\text{Percent Recovery} = 100 * (\text{Measured Value})/(\text{Known Standard Solution Value})$$

Percent recovery was then graphed as a Shewhart Control Chart. The average percent recovery was used as the accuracy of the analysis with the UCL and LCL describing the accuracy range that was achieved.

Precision of an analysis was calculated by performing two measurements on the same sample. This was typically performed on the flowing water influent to the PRS Monitoring Stations every week. The absolute values of the differences between the first and second measurements were graphed as a Shewhart Range Control Chart (Wheeler and Chambers 1992) and the UCL used as the precision of the analysis.

The accuracy and precision of each analysis in each water system changed over certain periods of time. For example, the tests were typically not as accurate and precise at the beginning of the monitoring project as they were a few months later. Or, there were time periods when an analysis might become more problematic. The quality control statistics and graphs called attention to these issues so that they could be remedied.

In Tables 5.8 and 5.9, the precision and accuracy of field tests are listed for each water system's monitoring effort where data from the complete monitoring period were combined for the calculation.

SUMMARY

Distribution system monitoring strategies and concepts were described in this chapter along with the specifics of this project's monitoring plans and data analyses.

The highlights of these results are summarized and water system results compared in Chapters 6 to 11.

Table 5.8
Precision of field tests for project #4586 (+/- units shown)

Item Measured	Units	Water System							
		A	B	C	D	E	F	G	H
Free Chlorine or Monochloramine for System A	mg/L	0.08	0.09	0.03	0.02	0.11	0.13	0.12	0.15
Total Chlorine	mg/L		0.06		0.02	0.09	0.09	0.09	0.11
Conductivity	µS/cm	3.0	1.9	3.1	20	17	8.4	12	26
Oxidation/Reduction Potential (ORP)	mV	17	30	67		29	44	30	28
pH	SU	0.04	0.12	0.07	0.05	0.10	0.09	0.11	0.22
Orthophosphate	mg/L as PO_4	0.02		0.03	0.03			0.18	0.29
Temperature	deg C		0.04		0.13	0.23	0.13		
Turbidity	NTU	0.02	0.04	0.05	0.23	0.26	0.53	0.36	0.38/ 0.30

Table 5.9
Accuracy of field tests for project #4586 in %

Item Measured	Water Systems and Their Average Accuracies							
	A	B	C	D	E	F	G	H
Conductivity	104	99.9	100	100	99.7	100	100	97.3
ORP	100	93.8	100		104	104	103	102
pH	100	100	100	100	100	101	99.3	101
Orthophosphate	101		100	101			102	109
Turbidity	101	89.6		100	115	114	108	134

Item Measured	Water Systems and Their Accuracy Values							
	A		B		C		D	
	Lower Value	Upper Value	Lower Value	Upper Value	Lower Value	Upper Value	Lower Value	Upper Value
Conductivity	82.4	125.5	98.5	101	99.8	100	97.1	104
ORP	99.6	100	86.1	102	99.8	100		
pH	99.8	100	99.3	101	100	100	98.3	102
Orthophosphate	95.7	106			98.5	101	86.1	115
Turbidity	97.2	105	78.2	101			99.0	101

Item Measured	Water Systems and Their Accuracy Values							
	E		F		G		H	
	Lower Value	Upper Value	Lower Value	Upper Value	Lower Value	Upper Value	Lower Value	Upper Value
Conductivity	97.2	102	97.6	103	99.2	101	85.5	109
ORP	100	107	99.4	108	99.4	106	93.2	110
pH	99.8	101	99.1	102	95.5	103	98.5	103
Orthophosphate					91.5	112	86.1	132
Turbidity	95.4	135	91.2	138	94.4	121	0.0	281

CHAPTER 6
MONITORING STATION DATA

Lead and copper concentrations from stagnating water in the PRS Monitoring Station test chambers are exaggerated from what would actually be seen in the distribution system. The conditions under which the PRS Monitoring Station operates are equivalent to an abandoned building at an extreme location in the distribution system where water residence time is high. In addition, the metal in the test chambers starts with a clean un-oxidized surface and builds up chemical scales and biofilms during the monitoring period. The scales that do develop are much younger than the scales that exist in the distribution system. This allows more metal to transfer from the metal surface into the water than existing scales would.

Therefore, the metals concentrations measured in the stagnating water from test chambers must not be taken out of context. They are higher than would typically be seen in the actual distribution system. They serve to magnify the chemical and microbiological mechanisms that are shaping the water quality for the water system under study and to represent water quality trends.

In a PRS Monitoring Station test chamber, the following relationships have been observed:

- Lead concentrations < 100 µg/L are considered good; lead concentrations < 50 µg/L are considered excellent.
- Copper concentrations < 200 µg/L are considered good; copper concentrations < 100 µg/L are considered excellent.

When these goals can be achieved under the extreme conditions of a PRS Monitoring Station test chamber, the distribution system is typically experiencing very low lead and copper concentrations. These goal lines are drawn on lead and copper concentration graphs in this report.

LEAD

Flowing System Water

Besides the stagnating test chamber water, system water flowing into the PRS Monitoring Station is monitored. The monitoring results reflect the character of the actual system water at the monitoring station location in the distribution system. In this project, all monitoring stations were located at high water age (least fresh/high residence time) locations.

An important question to answer in any water system is: what concentration of lead can be measured in the system water that potentially enters buildings around the distribution system. Table 6.1 shows that system water average lead concentrations, all at high water age locations, were considered low (<5 µg/L) in the eight water systems.

But, two water systems showed a high variation in the lead concentration. System B had a highest expected concentration (a statistical concept discussed in Chapter 5) of 15 µg/L. That might be explained by the fact that the system had an initial issue with the influent line to the PRS Monitoring Station, where water stagnated in an unrepresentative manner. When this issue was discovered, the station influent line was kept flushed. In addition, in System B, there was a period where water main flushing was nearby and the high lead concentrations in the sampled system water occurred around at that time.

Table 6.1
Total lead concentrations in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	3.6	3.1	2.6
B	*15	5.3	0
C	4.6	3.3	1.9
D	4.5	2.7	0.9
E	3.4	3.1	2.7
F	7.8	3.1	0
G	*11	4.4	0
H1	3.5	2.3	1.0
H2	4.6	2.5	0.4

*System B data possibly reflects temporary unrepresentative flow in the influent line to the PRS Monitoring Stations; after the discovery of this issue, the influent line was kept flushed. In addition, water main flushing nearby may have contributed to higher lead levels. System G data represents some system cleaning operations.

System G experienced a highest expected concentration of 11 µg/L. The high system water lead concentrations occurred at the initiation of system cleaning efforts.

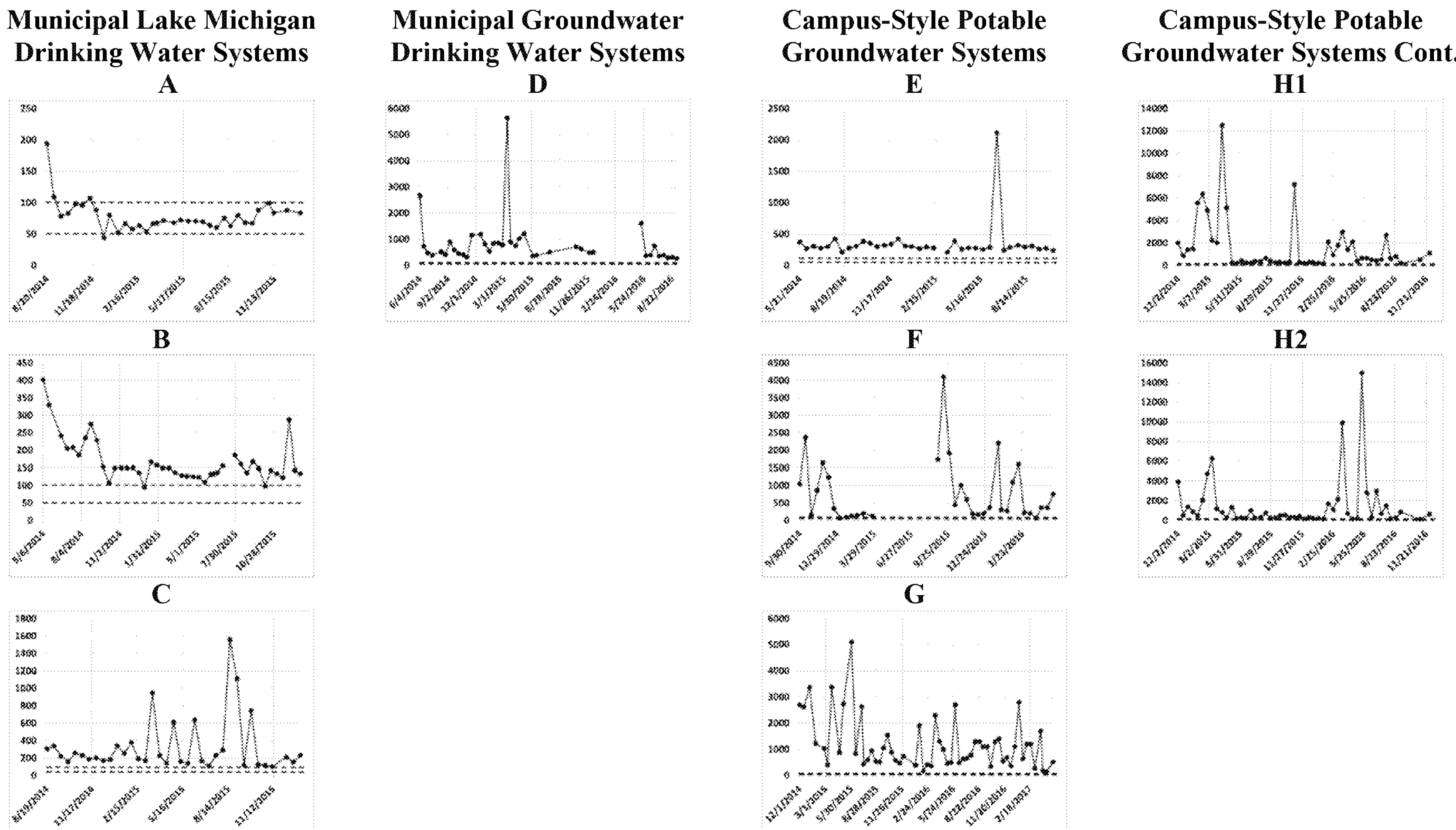
Stagnating Test Chamber Water

The total lead concentrations measured in stagnating water of the PRS Monitoring Station lead test chambers are shown in Figure 6.1.

On each graph, dotted lines are drawn horizontally at 50 and 100 µg/L of lead to show the concentration goals for release of lead in the lead test chambers. As previously mentioned, test chambers magnify the water system interactions. Based on past PRS Monitoring Station projects, releasing less than 100 µg/L of lead in a test chamber is representative of a water system under good lead control and good general water quality. Releasing less than 50 µg/L of lead in a test chamber is representative of a water system under excellent lead control and general water quality. Only Water System A had total lead concentrations in the target range. Water System B was close behind. All of the other water systems experienced greatly higher total lead release in the PRS Monitoring Stations.

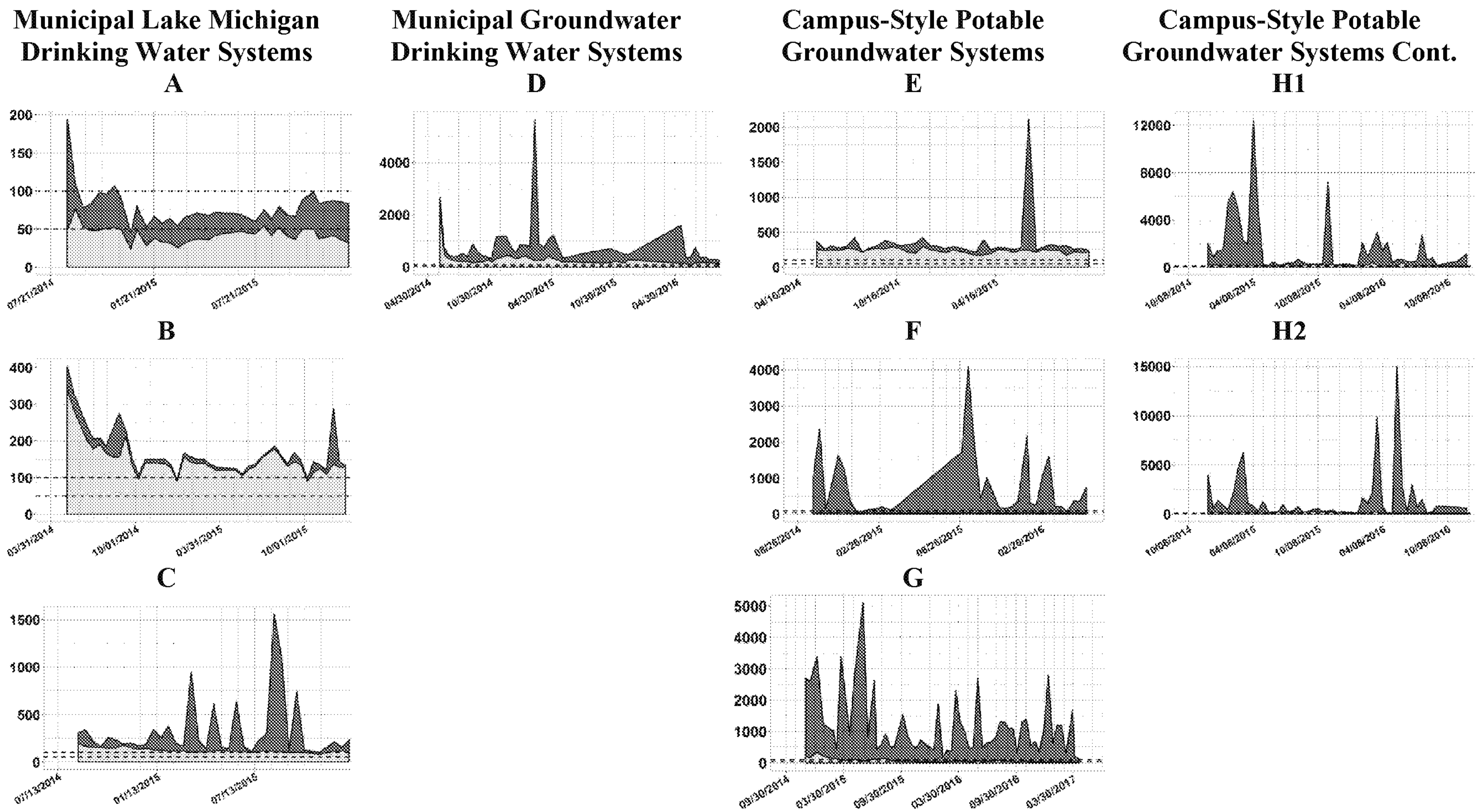
Figure 6.2 takes a closer look at the total lead concentrations, breaking the total concentration into its dissolved and particulate fractions of lead.

Water System A was seen to have dissolved lead concentrations meet the lower concentration range goal < 50 µg/L. However, the particulate lead concentration almost doubled the total lead concentration. So, even though the lead concentration ranges were satisfactory, the lead concentrations could have been cut by half if the particulate fraction was removed. A high percentage of particulate lead was also seen in this system during the residential profile sampling described in Chapter 3. In that situation, particulates of lead were shown to push the total lead concentration over the Action Level in an individual building while the water system was dosing orthophosphate to control dissolved lead.



1. F had a period of no monitoring during a water main replacement program.
2. D had a period of no monitoring while a new water treatment plant was optimized.

Figure 6.1 Total lead concentration released into PRS monitoring station lead test chamber stagnating water in µg/L



1. F had a period of no monitoring during a water main replacement program.
2. D had a period of no monitoring while a new water treatment plant was optimized.

Figure 6.2 Relative concentrations of dissolved and particulate lead fractions released into PRS monitoring station lead test chamber stagnating water in μg/L

Water System B had the lowest concentrations of particulate lead, the total lead being mostly in dissolved form. This was also found during the residential profile sampling described in Chapter 3.

All of the other water systems showed the potential to release concentrations of particulate lead at a level that dwarfed the dissolved lead concentrations.

The statistics for the dissolved, particulate, and total lead concentrations released in the PRS Monitoring Station lead test chambers are shown in Tables 6.2 to 6.4. Water Systems A, F, and G had average dissolved lead concentrations within the goal range of <100 µg/L. Particulate lead in all water systems significantly increased the total lead concentrations.

Table 6.2
Dissolved lead concentrations released into PRS monitoring station lead test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	64	43	21
B	201	146	92
C	147	121	96
D	573	297	22
E	309	235	160
F	52	35	18
G	149	82	15
H1	296	175	54
H2	293	191	89

Table 6.3
Particulate lead concentrations released into PRS monitoring station lead test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	59	36	12
B	66	21	0
C	889	204	0
D	1824	519	0
E	524	115	0
F	2624	748	0
G	3606	1182	0
H1	5172	1440	0
H2	6008	1340	0

Table 6.4
Total lead concentrations released into PRS monitoring station lead test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	115	78	42
B	251	167	83
C	1008	325	0
D	2248	816	0
E	773	350	0
F	2666	782	0
G	3688	1268	0
H1	5247	1593	0
H2	6097	1488	0

Total Lead = Dissolved Lead + Particulate Lead

COPPER

Flowing System Water

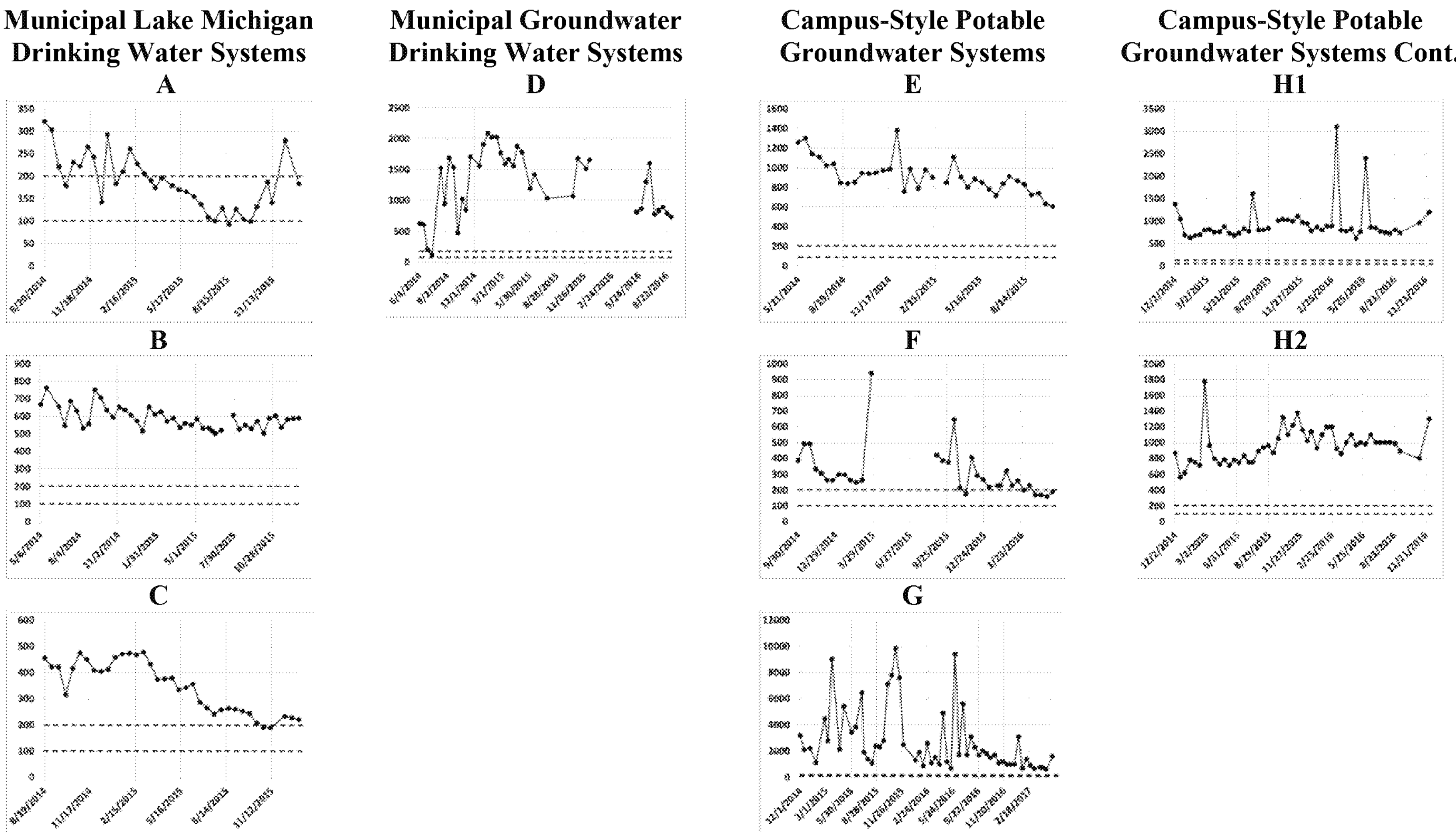
Table 6.5 shows the copper concentrations flowing in the system water at the high water age locations where the PRS Monitoring Stations were located. Anecdotally, concentrations <50 µg/L would be expected for system water copper levels. Water Systems D, G, and H have the highest concentrations of copper in the system water of the eight water systems.

Table 6.5
Total copper concentrations in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	5.5	5.1	4.6
B	33	11	0
C	24	16	7.6
D	166	90	14
E	53	27	0.5
F	18	9.1	0.2
G	1410	930	0
H1	79	48	17
H2	203	108	12

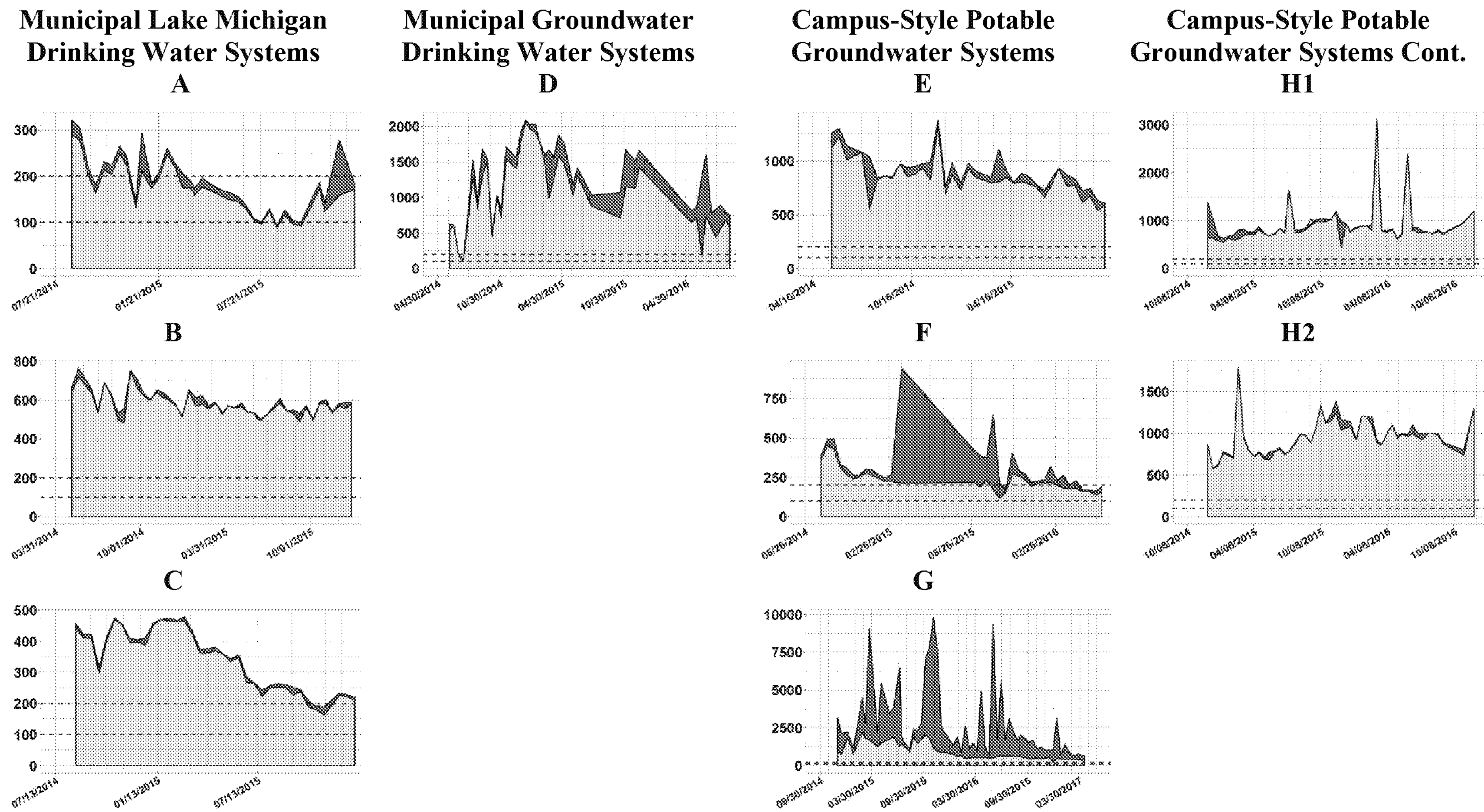
Stagnating Test Chamber Water

Figures 6.3 and 6.4 display the copper concentrations measured in the PRS Monitoring Station copper test chamber stagnating water.



1. F had a period of no monitoring during a water main replacement program.
2. D had a period of no monitoring while a new water treatment plant was optimized.

Figure 6.3 Total copper concentrations released into PRS monitoring station copper test chamber stagnating water in µg/L



1. F had a period of no monitoring during a water main replacement program.
2. D had a period of no monitoring while a new water treatment plant was optimized.

Figure 6.4 Relative concentrations of dissolved and particulate copper fractions released into PRS monitoring station copper test chamber stagnating water in μg/L

The goals for copper concentrations in a copper test chamber are <200 µg/L as satisfactory and <100 µg/L as excellent. These goals are drawn as dotted horizontal lines on the graphs. Water System A copper test chamber total copper release fell into the desired copper concentration range. Water System B hovered above the range. Water Systems C and F dropped into the range toward the end of the monitoring period. The other water systems released total copper in the copper test chambers at greatly higher concentrations than the desired range.

In Figure 6.4, Water Systems B, C, H1, and H2 released the lowest percent particulate copper concentrations in the copper test chambers. Water Systems A, D, and E released moderate quantities of particulate copper. (Water System A exhibited the same behavior in residential profile sampling described in Chapter 3.) Water System F released high particulate copper when water main construction began. Water System G routinely released high particulate copper concentrations in the copper test chamber.

The statistics for the dissolved, particulate, and total copper concentrations released in the PRS Monitoring Station copper test chambers are shown in Tables 6.6 to 6.8.

Table 6.6
Dissolved copper concentrations released into PRS monitoring station copper test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	248	169	89.2
B	714	576	438
C	413	336	259
D	1931	1038	146
E	1193	842	491
F	307	229	151
G	1674	1010	347
H1	1644	875	106
H2	1292	938	584

Table 6.7
Particulate copper concentrations released into PRS monitoring station copper test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	57	18	0
B	58	15	0
C	35	11	0
D	659	227	0
E	297	80	0
F	25	7.4	0
G	7949	2239	0
H1	251	71	0
H2	89	24	0

Table 6.8
Total copper concentrations released into PRS monitoring station copper test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	297	187	77.1
B	729	590	451
C	415	346	277
D	2158	1266	373
E	1211	918	625
F	575	313	51
G	8876	3191	0
H1	1680	937	194
H2	1326	958	590

Total Copper = Dissolved Copper + Particulate Copper

CORRELATIONS

As described in Chapter 5, many water quality parameters were measured in flowing system water and stagnating test chamber water in addition to tracking the dissolved and particulate lead and copper release in the test chambers. Common trends between lead and copper release and the other water quality parameters were studied visually using aligned time series graphs and mathematically using Spearman's rank correlation. Chapter 5 discusses the pitfalls of trending analyses, such as assuming cause and effect relationships or overlooking time lagged relationships. Nevertheless, it is informative to, at least, capture general relationships in order to form theories as to what mechanisms shape the water quality in an individual water system. Predictions of future water system behavior based on the theories must match measured observations of outcomes, otherwise theories must be changed. This is empirical science; it is a common industrial process control technique (Wheeler and Chambers 1992).

The overall narrative of water quality influences for each water system based on the observations and correlations are presented here. This project involved a great quantity of data, graphs, and correlations, which cannot all be discussed in this report. Some details of observed trending patterns are shown in Appendix A to accompany the narratives below.

Water System A

Two major seasonal events contributed to water quality characteristics in Water System A during the monitoring period. One event was alum dosing at the water treatment plant. Alum (aluminum sulfate) is used as a coagulant to lower the turbidity of the source water and was used in higher concentrations in cooler and colder temperatures of the year when the source water was more turbid. This introduced aluminum and sulfate into the water, each with their own patterns in the system water. Turbidity and pH were also related to the alum dosing. The second major seasonal event in this water system was nitrification. In the spring when temperatures began to rise, ammonia began releasing from the chloramine disinfection. Several weeks after the peak of ammonia release, the ammonia concentration diminished but dissolved organic carbon began to increase and peaked during the middle of summer. Dissolved lead released in the lead test chamber began to increase as ammonia was released; the dissolved lead diminished as the dissolved organic carbon diminished. Also initiated as the ammonia began to increase was the increase of nitrite/nitrate. This increase continued past the ammonia cycle and the dissolved organic carbon cycle on into the late autumn. Along with the nitrite/nitrate increase was an increase in dissolved copper release from the copper test chamber. Particulate metals measured in the system water and in the two test chambers trended with the nitrite/nitrate increase also. Here, turbidity, particulate iron, manganese, copper, and aluminum were measured in the upward trend. In addition, chloride, sulfate, and total phosphorus and particulate lead increased during this time period. Similar patterns have been seen for nitrification and lead and copper release in other PRS Monitoring Station projects in chloraminated water systems.

Water System B

Two phenomena were identified with Water System B that appeared to influence water quality. First, a crumbling manganese and iron scale on an existing lead service line had previously been identified by pipe wall scale analysis as a major source of capturing and transporting particulate lead in the water system. A uni-directional flushing program was carried out in the water system to remove the old scale. Flushing in the proximity of the PRS Monitoring Station in August 2014 sent higher particulate metals to the influent of the station; higher particulate lead and copper releases were measured at this time period along with measurements of elevated particulate iron, manganese, and aluminum. The particulate metals also peaked together in January 2015 – possibly from another system disturbance – and then again in September through December 2015.

Nitrification patterns were observed. The patterns were similar to those observed for chloraminated Water System A. That is, ammonia was released at the beginning of warmer temperatures, peaking in early summer. Several weeks later, dissolved organic carbon peaked. Nitrite/nitrate concentrations began an ascent as temperatures warmed which carried into late autumn.

Dissolved lead and aluminum release and dissolved solids concentration, in general, trended with the ammonia increase. Dissolved copper trended inversely with the ammonia release. Particulate lead, copper, and other metals were found to trend with nitrite/nitrate in the late summer and autumn.

It seemed odd to observe the nitrification patterns in a non-chloraminated water system and odd to see metals seemingly respond to this lower level of nitrification. A later study into the biostability of the system by others (communication with Dr. Andrew Jacque on 3/27/2017) found that the 2005 installation of a second water transmission line from the lake to the treatment plant appears to have influenced the microbiological activity in the water system. The residence time of water was greatly increased with the new transmission line and microbiological populations and biofilms increased before the treatment plant. Acetate, a simple organic carbon compound, and ammonia were found to be produced by the microbiological activity in the pipe and the specific microorganisms were identified by DNA analysis. In this way, the biostability study located the source of the ammonia, organic carbon, and nitrate patterns that were observed at the monitoring station where they were related to dissolved and particulate lead and copper release patterns.

Water System C

Water System C had pronounced particulate lead release in the lead test chamber. The lead release trended with particulate iron, manganese, and especially aluminum release. Particulate copper release in the copper test chamber trended with particulate aluminum.

Dissolved copper released in the copper test chamber trended inversely with dissolved aluminum release. The dissolved aluminum in the system water had a similar pattern as in Water System A, which uses alum (aluminum sulfate) as a coagulant as does Water System C. Sulfate concentrations followed opposite trends with dissolved aluminum as was seen in Water System A.

The nitrification patterns of ammonia, nitrite/nitrate, dissolved organic carbon, and lead and copper release were not observed in Water System C as they were in Water Systems A and B. Nitrite/nitrate concentrations did not increase over the summer and into the autumn as they did in Water System A. Instead, they increased in the later winter and early spring, occurring just before an increase in chloride. This is a curious finding and might be related to the spring snow melt period and the effect of road salt on Lake Michigan water within a mile of the shoreline. It is possible that particulate lead release followed the nitrite/nitrate concentration trend but other factors may be involved because the particulate lead release continued long after the end of the nitrate concentration peak.

Water System D

Water System D had a long history of elevated iron and manganese and microbiological activity because of the use of a unique water treatment technique used before 1995. During the monitoring program for this project, particulate lead and particulate copper release trended with particulate iron and manganese in the system water and co-releasing in the test chambers.

Dissolved copper and dissolved lead trended with total phosphorus. This may be the result of a high polyphosphate fraction of total phosphorus, which holds metals in water. Or, it may be from sloughing of phosphorus and metal-laden biofilm from pipe walls as nutrients were removed in the water system with the improved water treatment for organic carbon removal. There were also similar patterns for ammonia and nitrite/nitrate.

Alkalinity trended inversely with dissolved copper and dissolved lead – higher alkalinity meant lower dissolved copper and lead. This may have been a function of which wells were providing water to the monitoring station on a given sampling day. That is, the wells on the west side of the city fed a treatment plant where alkalinity would have increased slightly. That water had lower polyphosphate addition and other different water quality parameters than the east side wells.

In terms of biostability parameters and their effect on metals release in Water System D, nitrification patterns were not seen. Dissolved lead and copper trended with ammonia and nitrite/nitrate. These parameters trended inversely to dissolved organic carbon and microbiological population.

Water System E

Water characteristics fluctuated between system water from the iron and manganese removal filter and softened water early in the monitoring period in 2014. By 2015, all water to the station was softened. There was lower dissolved lead and copper release at that time.

The higher lead and copper release with fluctuating water quality characteristics may be a function of rapid water quality transitions where surface scales can re-solubilize and re-precipitate with changing water characteristics.

Chloride increased over the monitoring period probably due to the more continuous use of water softeners with their higher chloride output as the project progressed. Dissolved lead and copper release in the test chambers inversely trended with chloride in the system water. This is opposite to expectations where chloride is known to solubilize lead and copper from compounds on pipe walls. Since chloride concentration was related to the use of the softeners, one explanation is that the newly-installed softeners acted as a filter to the system water coming from the iron/manganese removal filter. The water directly from the iron/manganese removal filter was seen to be degrading in quality as measured by a continuously increasing turbidity after the filter. This would be an interesting turn of events since the original water softeners were observed to be discharging elevated microbiological populations and higher metals concentrations.

Dissolved manganese release in the water was similar in trends to particulate manganese release. Particulate lead released in the lead test chamber trended with the dissolved and particulate manganese release patterns as did particulate copper released in the copper test chamber.

Dissolved organic carbon in the system water decreased over time as did dissolved lead and copper release. This may be due to the softeners acting as a barrier to contaminants from the system water. However, microbiological populations increased in the test chambers by the end of the monitoring period.

As stated, turbidity after the main water treatment filter slowly increased over time indicating a need to clean the filter for better treatment efficiency and to insure that biofilms did not develop on the filter media. As the turbidity increased over time, the chlorine concentration in the system water decreased. It was suspected that the water quality improvement as measured in the test chambers would begin to degrade over time.

Water System F

Particulate lead released from the lead test chamber trended with particulate iron and manganese release, as has been seen in the other water systems. Particulate copper released from the copper test chamber also trended with particulate iron and manganese release.

Dissolved lead released from the lead test chamber was low and steady throughout the monitoring period. Dissolved copper released from the copper test chamber decreased over time, especially after distribution system rehabilitation.

Microbiological populations decreased after distribution system rehabilitation. Dissolved copper release trended with microbiological population. Dissolved lead release somewhat trended with microbiological population. Disinfection increased as the population decreased.

Water System G

Dissolved lead release and dissolved copper release decreased over time and were similar except that dissolved copper stayed at a higher level for a longer period and then dropped to the lower level.

Total phosphorus and dissolved copper trended together. Other dissolved metals followed similar patterns, such as calcium, magnesium, aluminum, iron, nickel, etc. Ammonia concentrations in the system water also followed this trend.

Particulate lead released from the lead test chamber trended with particulate iron and manganese release. Particulate copper released from the copper test chamber also trended with particulate iron and manganese release.

Dissolved lead and copper release trended with microbiological population as measured in the test chambers.

Water System H

Two campuses, each with their own PRS Monitoring Station, make up Water System H and receive water from the same wells. At both monitoring stations, particulate lead and particulate copper release trended with particulate iron and particulate manganese release. Dissolved lead and dissolved copper release trended with microbiological populations measured in the test chambers' water.

On Campus H2, dissolved lead release trended inversely with orthophosphate concentration in the water as well as trending directly with microbiological population.

METAL PLATE SCALE ANALYSIS

At the end of the monitoring periods in each water system, the internal metal plates were removed from the test chambers and sent for chemical and microbiological analysis of the scales and biofilms that had developed over the monitoring period. This is discussed in Chapter 5.

Tables 6.9 and 6.10 show the scale coverage on the plates. For Water System A in Table 6.9, scale coverage of 0.86 means that minerals had built up on 86 percent of the plate area. Fourteen percent of the plate area remained as bare metal at the time the plates were removed from exposure to the system water. In these water systems, scale formed more readily on lead surfaces (Table 6.9) than on copper surfaces (Table 6.10).

Tables 6.9 and 6.10 also list the general composition of the scales on the lead and copper plates. In x-ray diffraction analysis, minerals are identified. If a mineral has a peak higher than the other minerals, it is in greatest abundance on the plate. The other peaks are referred to as a percentage of the highest peak.

Minerals form in a succession from the least stable to the most stable as the compounds approach a thermodynamic equilibrium. In lead, litharge, a lead oxide, is the first to form. Then, the lead carbonates (cerussite and hydrocerussite) form. More stable minerals form under special conditions: plattnerite can form in a highly oxidizing environment; pyromorphite can form with a sufficient availability of orthophosphate ion.

In Table 6.9, the various combinations of litharge, cerussite, and hydrocerussite can be seen to have formed in the water systems. On the Water System A lead plates, these minerals were patchy and all exposed to the water as opposed to the carbonates overlying the litharge and preventing contact of the less stable compound with the water. Only Water System E showed the presence of the more insoluble plattnerite. Water System E had such a variety of lead compounds that it appeared it had been subjected to highly fluctuating oxidation potentials with changing precipitation and dissolution of compounds. Water System E was the water system where system water fluctuated between hard and soft water. Also, the scale was mostly of lead carbonate (cerussite) but it was very crumbly and prone to particulate lead release.

Water System D lead plate scales were oddly colored and will be discussed further as the metal plate scales are discussed in other chapters. Pyromorphite, found in Water System A, C, and E, is the desired mineral to form when adding orthophosphate for lead and copper corrosion control. It will be discussed further in Chapter 8.

For copper (Table 6.10), cuprite, a copper oxide, is the first mineral to form. Cuprite was the most common mineral found on the plates in this project. Tenorite, a copper oxide at a higher oxidation state, is more stable than cuprite and sometimes forms in cold water, although it is more likely to form in hot water. Only Water System F had a trace of tenorite. When alkalinity is sufficient, malachite, a copper carbonate, is the last mineral to form and is very stable. Water System E had a significant amount of the more stable mineral, malachite. For Water System D, cuprite was predominant with no malachite measured. However, the plates were green like the color of malachite. This will be discussed further as the metal plates scales are discussed in other chapters.

In addition to the identification and quantification of the minerals that formed on the lead and copper surfaces of the test chamber plates, other elements were found by other analytical techniques. Those findings will be discussed in later chapters.

Table 6.9
Major minerals on PRS monitoring station lead plates by x-ray diffraction

Water System	Scale Coverage	Litharge	Cerussite	Hydrocerussite	Plattnerite	Pyromorphite
		PbO	$PbCO_3$	$Pb_3(CO_3)_2(OH)_2$	PbO_2	$Pb_5(PO_4)_3Cl$
A	0.86	84		98		100
B	0.97	100	58	55		
C	0.99		100	28		35
D	1.00	70	60	100		
E	0.91		100		35	67
F	1.00	100	59			
G		Monitoring station will operate until June 2017				
H1	1.00	96	100	43		
H2	1.00	100	13	75		

Amounts are percent of largest x-ray diffraction peak for scale minerals
Scale coverage is (Pb metal peak on actual plate/Pb peak on pure metal)

Table 6.10
Major minerals on PRS monitoring station copper plates by x-ray diffraction

Water System	Scale Coverage	Cuprite	Tenorite	Malachite
		Cu_2O	CuO	$Cu_2CO_3(OH)_2$
A	0.33	100		
B	0.75	100		
C	0.93	100		
D	0.42	100		
E	0.63	100	2	13
F	0.89	49		100
G	Monitoring station will operate until June 2017			
H1	0.33	100		4
H2	0.43	100		2

Amounts are percent of largest x-ray diffraction peak for scale minerals
Scale coverage is (Cu metal peak on actual plate/Cu peak on pure metal)

SUMMARY

Lead and copper release trends were tracked in the stagnating water of PRS Monitoring Station test chambers in eight water systems. The concentrations of lead and copper release, although higher than actual water system release concentrations, indicated the release trends in the water system as operations and water chemistry changed over time.

The release patterns also indicated the degree that different forms of the metals – dissolved versus particulate – were found in the actual water system. Using trending analysis between a variety of other water quality parameters measured during the monitoring programs and the released metal forms, it was shown that different factors influence particulate lead and copper than influence dissolved lead and copper. In this project, factors co-trending with each metal fraction are summarized in Tables 6.11 and 6.12. Refer to Appendix A to study more trending details.

Regarding trending analysis, cause and effect are difficult to assign. Nevertheless, co-trending water quality parameters determined by graphical means and correlation calculations are the foundation of lead and copper release theories. It is seen that multiple factors work on the water system simultaneously shaping the final water quality, including lead and copper release.

More detailed aspects of the influencing factors are discussed in the following chapters:

- Chapter 7: Factors Related to Uniform Corrosion of Metals
- Chapter 8: The Influence of Phosphate on Corrosion of Metals
- Chapter 9: Factors Related to Biostability and Microbiologically Influenced Corrosion of Metals
- Chapter 10: Factors Related to Chemical Scale Formation and Dissolution and Their Influence on Metal Transport in Water Systems
- Chapter 11: Operations, Maintenance, and Cleaning of Water Systems and Their Influence on Metal Release

Table 6.11
Summary of factors co-trending with the release of dissolved lead and copper

Dissolved Lead

Parameter	Water System								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H1**	**H2**
Alkalinity				-					
pH	+								
Chloride					-				
Sulfate					+				
Iron									
Manganese									
Aluminum	+								
Nitrification	+	+							
Ammonia				+					
Nitrate				+					
Dissolved Organic Carbon				-	+				
Microbiological Population		+	+	-		+	+	+	+
Total Phosphorus	+		+	+					
Orthophosphate	+		+						-

Dissolved Copper

Parameter	Water System								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H1**	**H2**
Alkalinity				-					
pH	-								
Chloride					-				
Sulfate					+				
Iron									
Manganese									
Aluminum	-		-						
Nitrification	+	+							
Ammonia				+					
Nitrate				+					
Dissolved Organic Carbon	-			-	+				
Microbiological Population		+	+	-		+	+	+	+
Total Phosphorus	-		+	+			+		
Orthophosphate	-		+				+		-

+ = trended together; - = trended inversely

Table 6.12
Summary of factors co-trending with the release of particulate lead and copper

Particulate Lead									
Parameter	**Water System**								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H1**	**H2**
Alkalinity									
pH									
Chloride									
Sulfate									
Iron		+	+	+		+	+	+	+
Manganese	+	+	+	+	+	+	+	+	+
Aluminum	+	+	+			+	+		
Nitrification	+								
Ammonia									
Nitrate									
Dissolved Organic Carbon	-								
Microbiological Population									
Total Phosphorus									
Orthophosphate									

Particulate Copper									
Parameter	**Water System**								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H1**	**H2**
Alkalinity									
pH									
Chloride									
Sulfate									
Iron	+	+		+		+	+		+
Manganese	+	+		+	+	+	+		+
Aluminum	+	+	+			+			
Nitrification	+								
Ammonia									
Nitrate									
Dissolved Organic Carbon	-								
Microbiological Population			+						
Total Phosphorus									
Orthophosphate									

+ = trended together; - = trended inversely

CHAPTER 7
FACTORS RELATED TO UNIFORM CORROSION OF METALS

A fundamental aspect of lead and copper corrosion is a phenomenon called "uniform corrosion" which was described in Chapter 1.

This chapter explores aspects of uniform corrosion to determine how significant the phenomenon might be in controlling lead and copper release to the drinking water in the participating water distribution systems.

CARBONATE SOLUBILITY

Data

The focus of the Lead and Copper Rule is on the lead and copper carbonate compounds that are formed in the uniform corrosion process. The water quality parameters of pH, alkalinity, conductivity, hardness, and temperature control the formation of the lead and copper carbonate compounds and their solubility. Tables 7.1 to 7.5 list the statistics for these water quality parameters measured in the eight water systems studied. All parameters were measured in the system water flowing into the PRS Monitoring Station test chambers. This was a location of high water age in each distribution system.

Calculated Parameters

Using the water quality parameters listed in Tables 7.1 to 7.5, other uniform corrosion-related parameters can be calculated. Table 7.6 shows the calculated parameters for the participating water systems using the average values of parameters measured over the system monitoring periods. The calculation is performed using the RTW computer model (Tetra Tech and AWWA 2011).

Dissolved inorganic carbon (DIC) is the carbonate concentration in the water. Because the EPA lead and copper solubility models are based on solubility of lead and copper carbonate compounds, it is important to calculate the concentration of the carbonate in the water. DIC is somewhat synonymous with alkalinity. However, alkalinity is a combination of carbonates and other constituents in water that function to neutralize acids. DIC is calculated by knowing the alkalinity of the water as well as the other parameters previously mentioned. Early research in water system corrosion found that a DIC greater than about 10 but less than about 50 mg/L as carbon is important in lowering lead and copper corrosion (AwwaRF and DVGW 1996). In this study, the surface water systems A, B, and C were considered to have satisfactory concentrations of carbonate in addition to System D, which has shallow wells with lower alkalinity water. The other water systems have deeper wells with much higher alkalinity and DIC above what would be considered a satisfactory level.

Table 7.1
Conductivity in flowing system water at a high water age location in µmhos/cm (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average	Lowest Expected Concentration
A	333	308	283
B	308	299	290
C	344	305	266
D	980	516	51
E	588	504	420
F	673	618	563
G	581	522	462
H1	1120	815	509
H2	1104	819	534

Table 7.2
Total hardness in flowing system water at a high water age location in mg/L as $CaCO_3$ (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	144	135	126
B	146	136	127
C	150	138	127
D	117	92	66
E	159	27	0
F	355	316	276
G	306	272	238
H1	445	397	348
H2	434	394	353

Table 7.3
pH in flowing system water at a high water age location in SU (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average	Lowest Expected Concentration
A	8.1	7.9	7.8
B	8.1	7.9	7.6
C	7.9	7.8	7.7
D	7.9	7.3	6.6
E	8.3	7.9	7.5
F	7.7	7.5	7.3
G	7.8	7.5	7.3
H1	7.6	7.4	7.1
H2	7.7	7.4	7.1

Table 7.4
Total alkalinity in flowing system water at a high water age location in mg/L as CaCO3 (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	112	103	93
B	122	107	92
C	118	99	79
D	101	69	36
E	247	222	197
F	297	284	272
G	281	263	245
H1	329	309	289
H2	336	308	280

Table 7.5
Temperature in flowing system water at a high water age location in degrees C (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	15.2	12.6	9.9
B	14.7	12.5	10.3
C	14.8	13.1	11.3
D	20.9	17.5	14.1
E	15.4	12.7	9.9
F	12.5	10.7	8.9
G	11.9	10.6	9.3
H1	17.0	14.6	12.2
H2	20.6	15.3	10.1

The Calcium Carbonate Precipitation Potential (CCPP) and the Langelier Index have been suggested in corrosion literature as a basis for determining the corrosivity of water (Tetra Tech and AWWA 2011; APHA et al. 1995). These parameters quantify the degree to which calcium carbonate, a common constituent in water, will precipitate on the pipe walls. It was believed that calcium carbonate could form a protective layer on pipe walls to inhibit corrosion as was described for lead and copper carbonates. Early research showed that this was a misconception. Calcium carbonate forms a course, non-uniform, and porous scale and cannot inhibit corrosion of piping in water systems (AwwaRF and DVGW 1996). The EPA issued a corrosion guidance manual in 2016 that also recommended the practice of basing corrosivity of water on calcium carbonate precipitation be stopped (EPA 2016a).

Table 7.6
Calculated water quality parameters' average values in flowing system water at a high water age location (PRS monitoring station influent tap)

Water System	DIC mg/L as C	CCPP mg/L as CaCO3	Langelier Index
A	25	2.7	0.2
B	26	3.2	0.2
C	24	1.2	0.1
D	18	-11	-0.7
E	55	-4.6	-0.2
F	73	44	0.5
G	67	37	0.5
H1	80	60	0.6
H2	80	61	0.6
Value recommended by corrosion literature	*>10 and <50	*10 to 20	*>0

*DIC recommendation source: AWWA and DWVG 1996; CCPP and Langelier Index recommendation source: Tetra Tech and AWWA 2011; APHA et al. 1995
Values over the recommended value are shaded in the table.

CHLORIDE AND SULFATE SOLUBILITY

Data

Chloride and sulfate can also be significant factors in metal corrosion. Chloride and sulfate can be components of water treatment chemicals or constituents in the source water transferred from rocks and soil. Chloride can also enter the water supply as a residual from road salt. Compounds of lead and copper with chloride and sulfate are many magnitudes more soluble than lead and copper carbonate compounds. Chloride and sulfate concentrations found in the system water flowing into the PRS Monitoring Station are listed in Tables 7.7 and 7.8.

Table 7.7
Chloride concentration in flowing system water at a high water age location in mg/L (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	17	15	14
B	15	14	13
C	19	16	12
D	152	82	11
E	29	21	14
F	20	18	16
G	8.0	5	2
H1	114	77	41
H2	138	78	19

Table 7.8
Sulfate concentration in flowing system water at a high water age location in mg/L (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	29	25	22
B	24	22	20
C	27	25	23
D	12	7.9	3.7
E	10	9.0	7.5
F	27	22	17
G	19	14	9.0
H1	48	41	35
H2	54	39	24

Calculated Parameters

Various researchers have studied the corrosive effects of chloride and sulfate in context with other factors. One aspect of their chemistry is that they compete with carbonate to form compounds of lead and copper. If the carbonate is high relative to the chloride and sulfate concentrations, less-soluble carbonate compounds are formed more readily and increased solubility of lead and copper from chloride and sulfate compounds becomes less significant. In other words, the corrosivity of the water is dependent on "the proportion of corrosive agents to the inhibitive agents," where chloride and sulfate are corrosive and carbonates are inhibitive (Larson and Skold 1958). The Larson-Skold Index has been used to express this competition. If the Larson-Skold Index is greater than 0.8, metals corrosion, including lead and copper, will be higher than desired (Masten et al. 2016). The calculated values for the water systems studied are shown in Table 7.9. Water System D had a Larson-Skold Index>0.8.

Table 7.9
Larson-Skold Index in flowing system water at a high water age location (PRS monitoring station influent tap)

Water System	Maximum Calculated Value	Average Value	Minimum Calculated Value
A	0.47	0.39	0.35
B	0.37	0.34	0.31
C	0.80	0.43	0.37
D	2.1	1.4	0.12
E	0.16	0.14	0.12
F	0.15	0.14	0.12
G	0.10	0.07	0.06
H1	0.70	0.40	0.26
H2	0.52	0.39	0.25

Larson-Skold Index = (Chloride + Sulfate)/(Alkalinity)
Larson-Skold Index recommendation source: Masten et al. 2016

The chloride to sulfate mass ratio (CSMR) was studied as a factor in galvanic corrosion in a water system, including corrosion of lead from lead solder and lead pipe connected to copper pipe (Nguyen et al. 2010). In addition, chloride compounds typically have a higher solubility than sulfate compounds. A higher CSMR indicates a greater potential for more soluble metal corrosion by-products. It was recommended that the CSMR be kept to <0.2 at best and <0.5 at most to prevent galvanic corrosion. A refinement of this recommendation advised to keep the CSMR <0.77 (Nguyen et al. 2011). The calculated values for the water systems studied are shown in Table 7.10. Water Systems D, E, F, and H have a CSMR>0.77. Water Systems A, B, C have a CSMR around 0.6. Only Water System G had a low CSMR.

Table 7.10
Chloride to sulfate mass ratio (CSMR) in flowing system water at a high water age location (PRS monitoring station influent tap)

Water System	Maximum Calculated Value	Average Value	Minimum Calculated Value
A	0.69	0.61	0.50
B	0.79	0.65	0.59
C	0.84	0.61	0.54
D	14	10	5.7
E	3.1	2.4	1.7
F	1.0	0.82	0.62
G	0.51	0.37	0.21
H1	2.6	1.9	1.3
H2	2.4	1.9	1.3

CSMR = Chloride/Sulfate
CSMR recommendation source: Nguyen et al. 2011

PHOSPHATE SOLUBILITY

Orthophosphate-based chemical products are used for lead and copper control as recommended and sometimes required by the Lead and Copper Rule. Orthophosphate ions form insoluble compounds with lead and copper and can create barriers on metal surfaces to inhibit the uniform corrosion process. Chapter 8 is dedicated to exploring the effects of orthophosphate on lead and copper release in the PRS Monitoring Station test chambers and they will not be discussed here.

SOLUBILITY UNDER HIGHLY OXIDIZING CONDITIONS

In 2005, it was acknowledged in the technical literature that the EPA solubility models and the Lead and Copper Rule had not taken into account the possible formation of a lead oxide that is highly insoluble (Lytle and Schock 2005). The lead oxide is the plattnerite mineral. It can only form when the lead ion has lost four electrons instead of the typical two. The only way four electrons can be lost is if the water environment is highly oxidizing. The oxidation/reduction potential (ORP) measures the oxidizing potential in the water environment. The higher the ORP, the more oxidizing the environment. If ORP is negative, it is a reducing environment. As an anecdotal guide, it is desired to see ORP values > 400 mV. Over 600 mV is excellent. All water systems had high average ORP values as seen in Table 7.11, although some water systems had periods of low values.

Table 7.11
Oxidation reduction potential (ORP) in system water at a high water age location in mV (PRS monitoring station influent tap)

Water System	Highest Expected	Average	Lowest Expected
A	782	704	627
B	739	642	545
C	758	532	306
D	No data		
E	671	514	358
F	732	572	411
G	749	524	300
H1	751	646	540
H2	732	589	446

EPA PREDICTED RELEASE OF LEAD AND COPPER

As stated previously, the Lead and Copper Rule is based on an idea that there is only one mechanism by which lead and copper are transferred from metal surfaces into drinking water (Code of Federal Regulations 2010b). In this concept, lead and copper are found in the water in dissolved form as soluble lead or copper carbonate compounds. The more insoluble fractions of the lead or copper carbonate compounds are assumed to form fine films on metal surfaces. These fine films can inhibit further transfer of metal ions between the metal surface and the water.

The carbonate solubility models behind the Lead and Copper Rule can be represented in graphical form. The graphs in Figure 7.1 are representations of the carbonate solubility model for prediction of lead release into water. In this model, water between pH 7 and 9 will have lower lead release than water with pH less than or greater than that range. There exists a pH somewhere within the range where lead release climbs to a maximum and then decreases as the pH continues to increase. In addition, DIC in a range of about 10 to 50 mg/L as carbon has the lowest lead release. Lower and higher DIC water types are predicted to release more lead.

The interplay between lead release and alkalinity (or dissolved inorganic carbon) and pH is based on the presence of two types of lead carbonates that are often observed coating leaded materials – cerussite (PbCO3) and hydrocerussite (Pb3(CO3)2(OH)2). Each type of lead carbonate exhibits its own solubility in water based on pH and alkalinity. Both carbonates become more soluble as pH decreases (water becomes more acidic). However, hydrocerussite is more soluble than cerussite at a pH less than 7.8. Theoretically, the more insoluble cerussite will form on the metal surfaces, inhibit the formation of hydrocerussite and control the lead solubility in the system. With alkalinity, the solubility of cerussite versus hydrocerussite varies based on pH. At a pH of 7, cerussite will be less soluble than hydrocerussite and will form on the metal surfaces, controlling the lead solubility in the water. At a pH of 8, hydrocerussite will theoretically dominate because it will be more insoluble than cerussite when the alkalinity is below 100 mg/L as CaCO3; above 100 mg/L, cerussite will control the lead solubility. (Communications with Dr. J. Barry Maynard on 4/19/17).

Figure 7.2 represents the carbonate solubility model behind the Lead and Copper Rule for copper. In addition, it has been proposed to be the basis of a Rule revision by which water systems will be deemed corrosive or non-corrosive to copper (Schock and Lytle 2014; Roth et al. 2016). From the figure, it is seen that the copper model, similar to the one for lead, predicts increasing copper release with lower pH and higher alkalinity. The shaded area on the graph delineates the alkalinity and pH combinations that are assumed to release copper over the Maximum Contaminant Level Goal (and coincidently, the Action Level) of 1300 µg/L. Those water systems will be assumed to always have elevated copper levels.

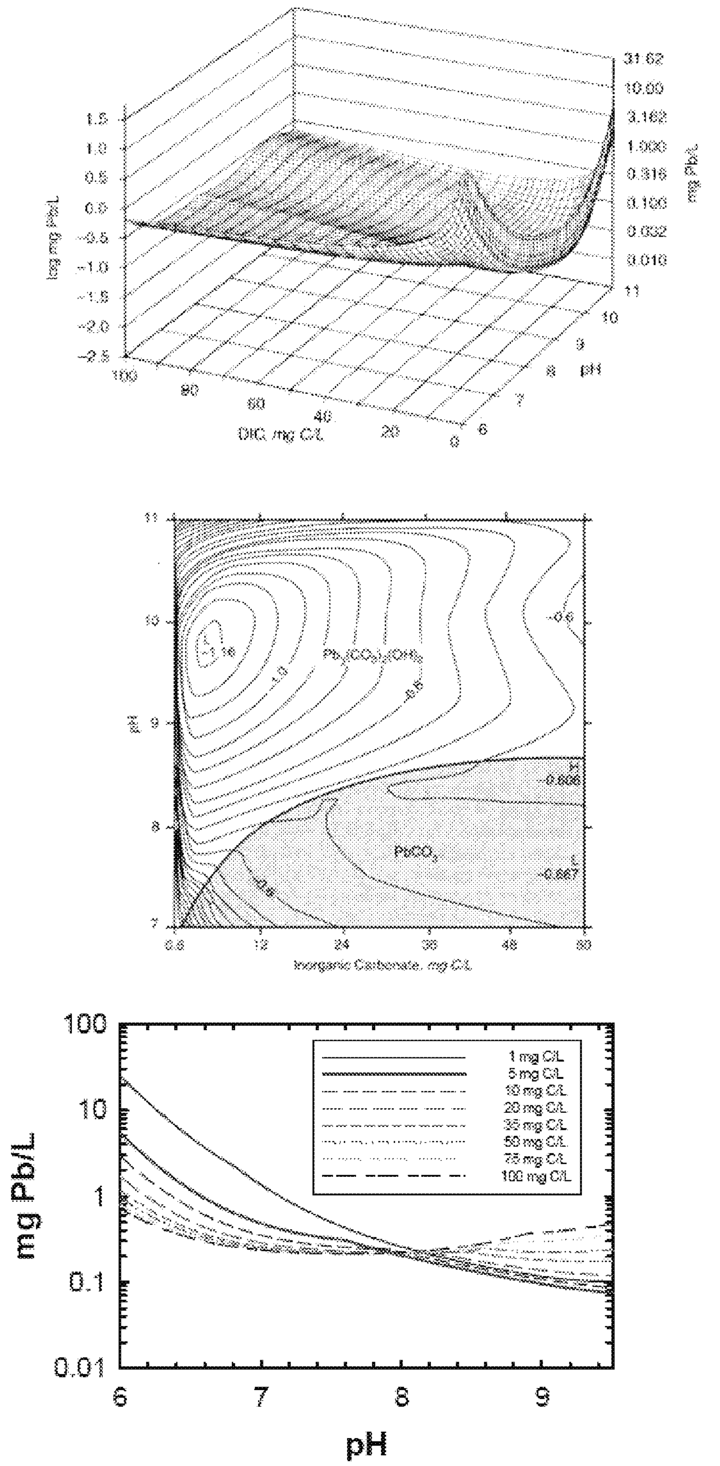
Steady State of Lead Release

The solubility model graphs can be used to predict the lead concentrations that would be expected in each of the project water systems. Then, the lead release data from the PRS Monitoring Station lead test chambers can be compared with the predictions. But, care must be taken to select the correct lead and copper release data. Of first consideration is that the EPA predictions are for dissolved lead concentrations only. The particulate lead concentrations measured in the eight water systems will not be used for comparison.

For the dissolved lead data, there was an initial time period when clean metal surfaces of the test chamber metal plates were first exposed to the system water. An explanation of uniform corrosion earlier in this chapter described a dynamic process of metals being released from piping material as ions, the metal ions forming new compounds in the water, and the rate and nature of the corrosion being controlled by the precipitation of the new compound as protective scales on the metal surfaces. These scales are typically composed of oxides and carbonates. Refer to Table 6.9 to see that oxides and carbonates did form in the lead test chamber. (Copper oxides and carbonates also formed as shown in Table 6.10.) Also, the dissolved lead concentrations measured in the PRS Monitoring Station test chamber stagnating water quite often show very high levels at first with a steep slope down to a lower steady state concentration range. Refer to Figure 6.2 Water Systems A, B, and D, to view the steep drop in dissolved lead concentration from clean metal newly exposed to water. (A similar copper release trend can be seen in Figure 6.4). The data to compare to the EPA solubility graphs are the dissolved lead concentrations measured in the stagnating lead test chamber water after a "steady state" concentration range has begun. From the monitoring station data, it is seen that a true steady state never occurs as each form of lead and copper is buffeted around by many factors over time. Nevertheless, the solubility model assumes that the water system is at equilibrium, so the most constant time period of measured monitoring data should be chosen for comparison.

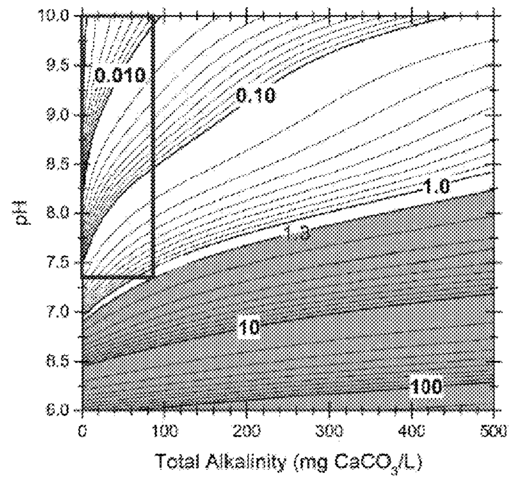
The determination of the steady state time period for monitoring station data was described in Chapter 5. A statistical method using Shewhart Control Charts was described. But, it was noted that many times the selection becomes subjective because of confounding water system events that buffet the lead concentrations up and down even during the initial scale formation period. Table 7.12 lists the number of days it took in each water system from the date of metal plate installation in the PRS Monitoring Stations until the dissolved lead concentrations exhibited the end of what appeared to be the initial scale formation period.

Table 7.13 lists the new dissolved lead statistics for each lead test chamber with the initial scale development period data removed from the data set and a more constant range of dissolved lead utilized for the statistical calculations.



Source: AwwaRF and DVGW 1996 (top and middle), and Brown et al. 2015, adapted from Schock and Lytle 2011 (bottom).

Figure 7.1 Representations of the EPA carbonate solubility model of lead



Source: Schock and Lytle 2014.

Figure 7.2 Representation of the EPA carbonate solubility model of copper

Table 7.12
Days to "steady state" for dissolved lead release in lead test chamber stagnating water

Utility Name	Days
A	240
B	176
C	247
D	76
E	35
F	370
G	371
H1	98
H2	55

Table 7.13
Dissolved lead concentrations released in lead test chamber stagnating water after "steady state" in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	58	42	26
B	171	130	88
C	126	105	85
D	401	242	82
E	309	235	160
F	47	34	20
G	85	50	15
H1	298	173	48
H2	293	191	89

Steady State of Copper Release

The steady state release of dissolved copper from the PRS Monitoring Station copper test chambers was also determined. Table 7.14 lists the number of days it took in each water system from the date of metal plate installation in the PRS Monitoring Stations until the dissolved copper concentrations exhibited "steady state" behavior.

Table 7.14
Days to "steady state" for dissolved copper in copper test chambers

Utility Name	Days
A	353
B	302
C	37
D	104
E	119
F	175
G	511
H1	55
H2	55

Table 7.15 lists the new dissolved copper statistics for each copper test chamber with the initial scale development data removed from the data set and a more constant range of dissolved copper utilized for the statistical calculations.

Table 7.15
Dissolved copper concentration in copper test chamber after "steady state" in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	195	122	49.4
B	633	549	465
C	413	336	259
D	1977	1116	255
E	1124	809	494
F	262	196	130
G	610	542	474
H1	1644	875	106
H2	1292	938	584

Comparisons between EPA Predictions and PRS Monitoring Station Lead and Copper Release Data

Figure 7.3 compares the average steady state dissolved lead release from PRS Monitoring Station lead test chambers to the EPA dissolved lead release predictions. There does not appear to be a relationship between the predictions and the actual release data. The relationship was explored again by comparing the test chamber data to average dissolved inorganic carbon concentration (DIC) for each water system in Figure 7.4. According to the carbonate solubility theory, dissolved lead release should be organized in some respect with DIC. The trend line and its correlation coefficient show that there was no linear relationship. Visually, the graph indicates that there were no other dependencies between the two variables.

Figure 7.5 compares the average steady state dissolved copper release from PRS Monitoring Station copper test chambers to the EPA dissolved copper release predictions. In this case, the lower DIC water systems appear to match the predictions. The higher DIC water systems are highly over-estimated.

The correlation of the lower DIC water with the predictions is confusing. In Table 6.11, nitrification and alum dosing were identified as two major factors that co-trended with dissolved copper release in this project with low DIC water systems. In addition, Figure 7.6 shows no relationship between steady state dissolved copper release and DIC, the water quality parameter underlying the carbonate solubility predictions. Therefore, the EPA predictions for copper release may coincidently correspond to the actual release at low DIC.

There are other indications that the EPA solubility model may not reflect reality. When the EPA model predictions are compared with predictions of lead and copper release from other standard solubility models, such as Phreeqc, there are discrepancies in the predicted concentrations. This comes from a difference in thermodynamic solubility parameters used in each model for species of carbonate complexes, such as for $PbHCO3+$. (Communications with Dr. Barry Maynard on 4/19/17).

The solubility models assume that the water/metal system is at equilibrium. However, studies of surface scale in this study have shown the presence of amorphous, thermodynamically unstable compounds of aluminum, iron, and manganese with their ability to adsorb other contaminants such as lead or copper. (This will be described in Chapter 10.) Non-equilibrium states are not accounted for in the solubility model. (Communications with Dr. Barry Maynard on 4/19/17).

Another observation of metal surfaces is that there is a diversity of lead and copper compounds that form and are present at the same time. The lead solubility cannot be predicted for such a mixed assemblage. (Communications with Dr. Barry Maynard on 4/19/17). This has also been acknowledged by others (DeSantis and Schock 2014). It is also seen in scale study results shown in Tables 6.9 and 6.10 for this project.

Comparisons between Calcium Carbonate Precipitation Indices and PRS Monitoring Station Lead and Copper Release Data

The role of calcium carbonate precipitation and lead corrosion was discussed earlier in this chapter. In summary, it was originally assumed that calcium carbonate, a common mineral in drinking water, could precipitate on the pipe walls and form a barrier to the uniform corrosion process. Researchers over several decades have proven this assumption incorrect. Nevertheless, it persists as a guide to lead and copper corrosion in the drinking water field (Tetra Tech and AWWA 2011; APHA et al. 1995).

Using the average steady state dissolved lead release data from the PRS Monitoring Station lead test chambers for each water system, lead release is compared to the calculated calcium carbonate precipitation potential in Figure 7.7. There is no correlation between the two parameters. In Figure 7.8, the exercise is repeated using the Langelier Index, of similar meaning to calcium carbonate precipitation potential. One data point that falls out of range with the other data points pulls the trend line into a stronger correlation. However, even though the correlation appears stronger, it is still below a correlation that could occur by chance.

The exercise is repeated for steady state dissolved copper release as seen in Figures 7.9 and 7.10. As with lead, there are no relationships between the indices and copper release.

Comparisons between Chloride and Sulfate Related Indices and PRS Monitoring Station Lead and Copper Release Data

Figures 7.11 to 7.14 compare steady state dissolved lead and copper release to the Larson-Skold Index and the Chloride to Sulfate Mass Ratio (CSMR). Similar to the calcium carbonate indices, there are no relationships between the metals release and the Larson-Skold Index regarding chloride and sulfate for the participating water systems.

In Figures 7.12 and 7.14, the CSMR has a strong fit using an exponential function. This does not confirm a connection between CSMR and galvanic corrosion but does put more weight on the fact that chloride compounds of metal are more soluble than sulfate ones.

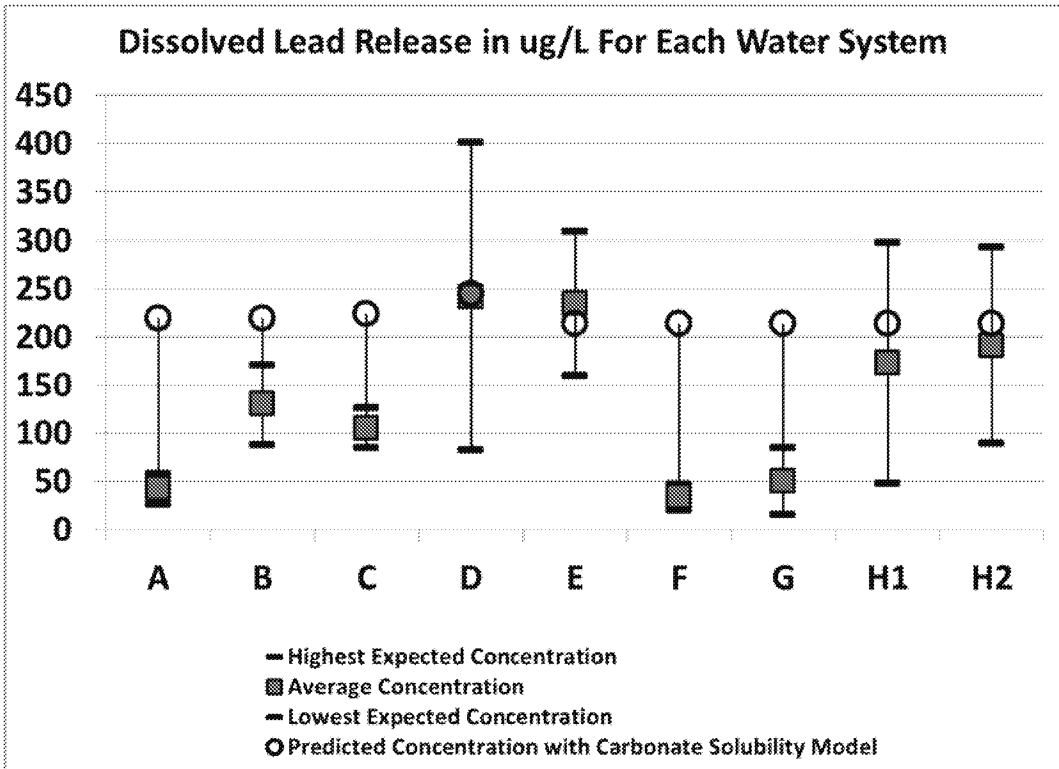


Figure 7.3 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water compared to EPA dissolved lead release predictions

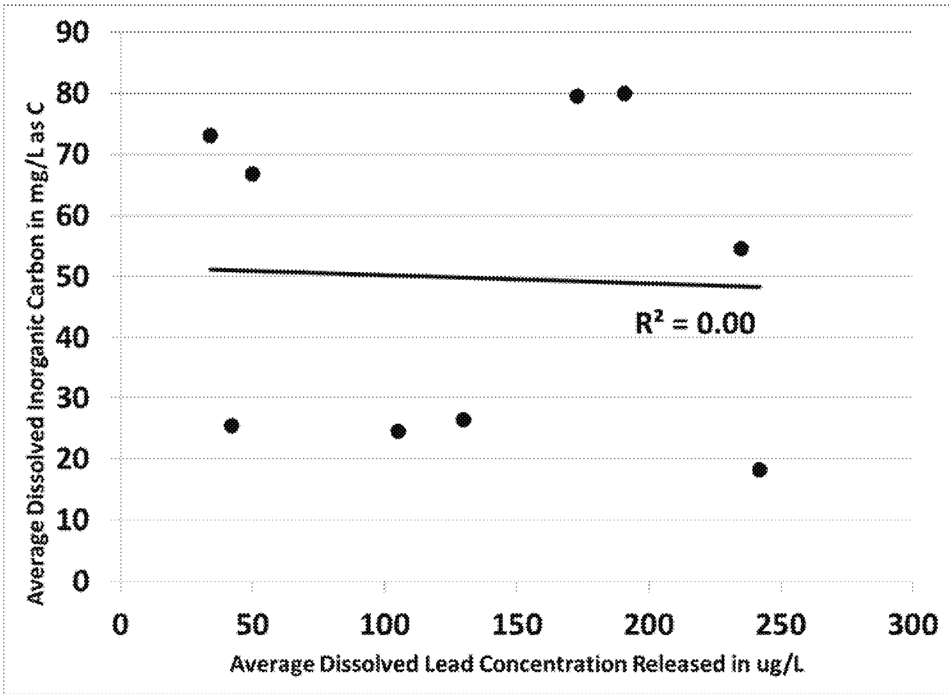


Figure 7.4 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water in each water system compared to dissolved inorganic carbon concentration of the flowing system water

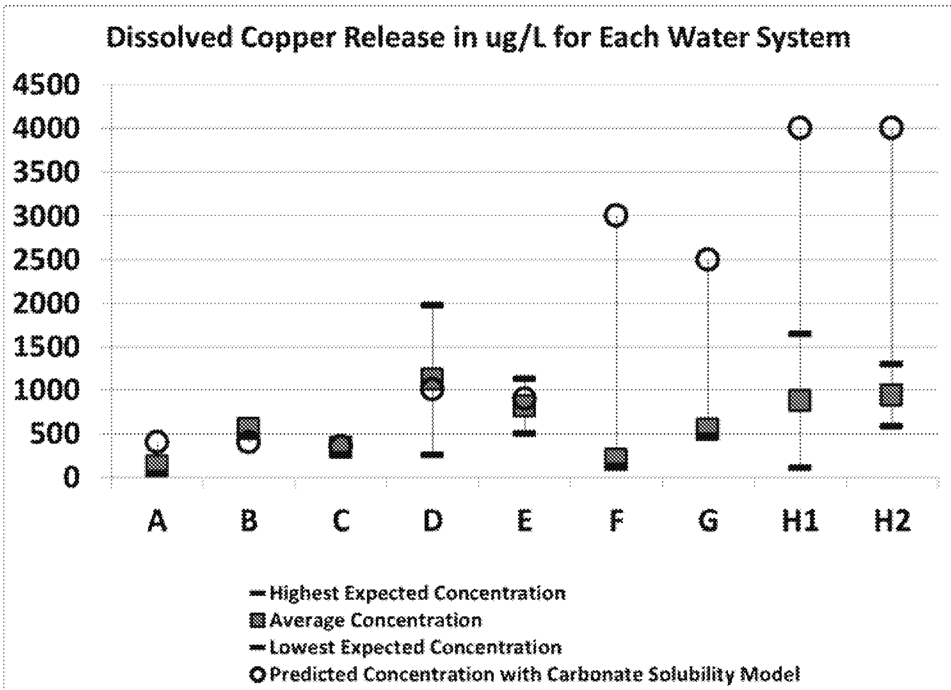


Figure 7.5 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water in each water system compared to EPA dissolved copper release predictions

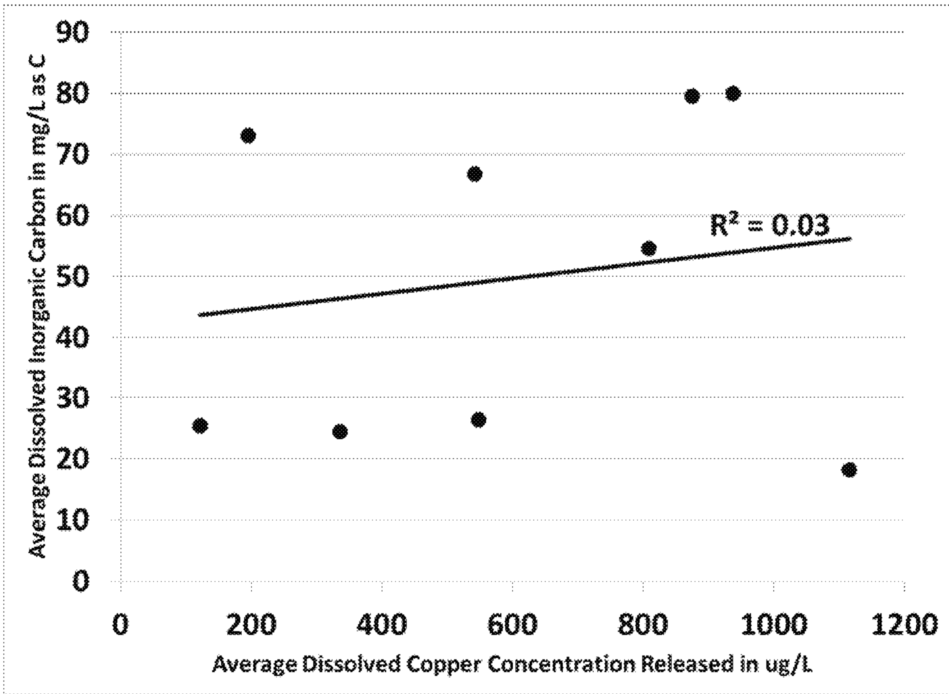


Figure 7.6 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water compared to dissolved inorganic carbon concentration of the flowing system water

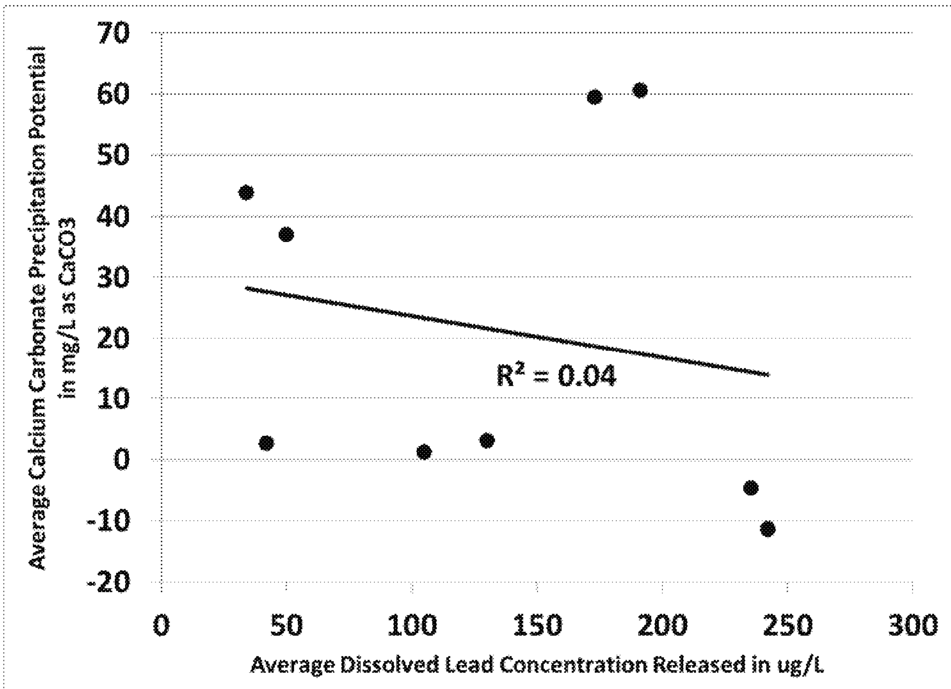


Figure 7.7 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water compared to calcium carbonate precipitation potential of the flowing system water

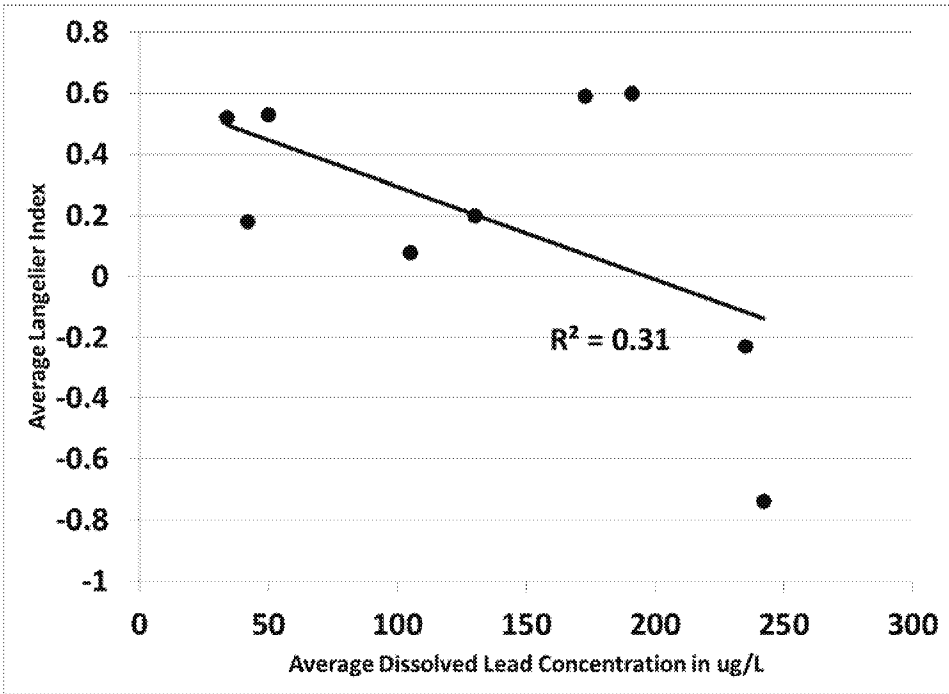


Figure 7.8 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water compared to the Langelier Index of the flowing system water

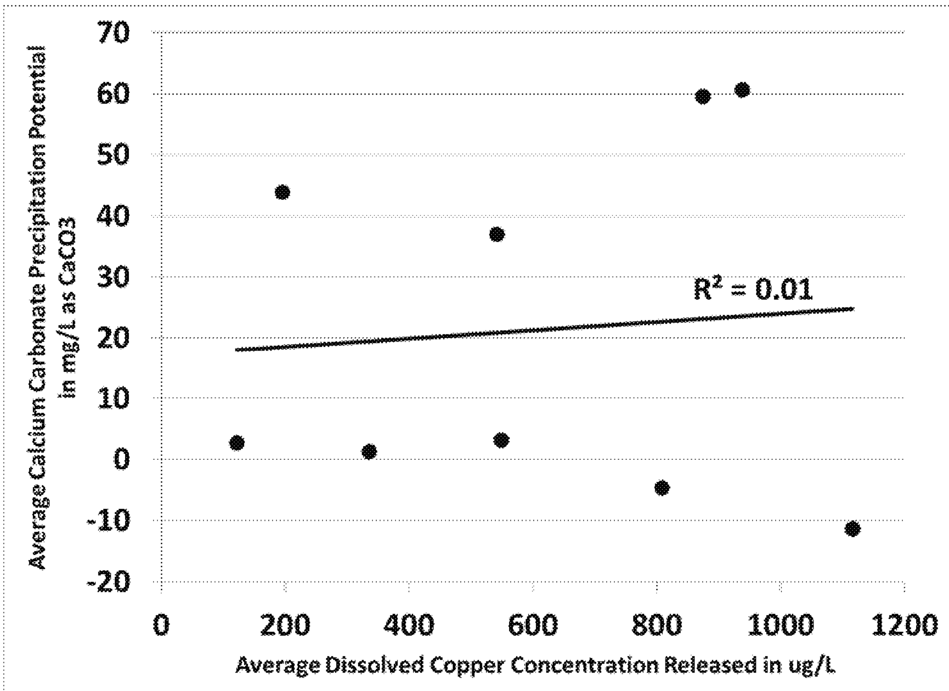


Figure 7.9 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water compared to calcium carbonate precipitation potential of the flowing system water

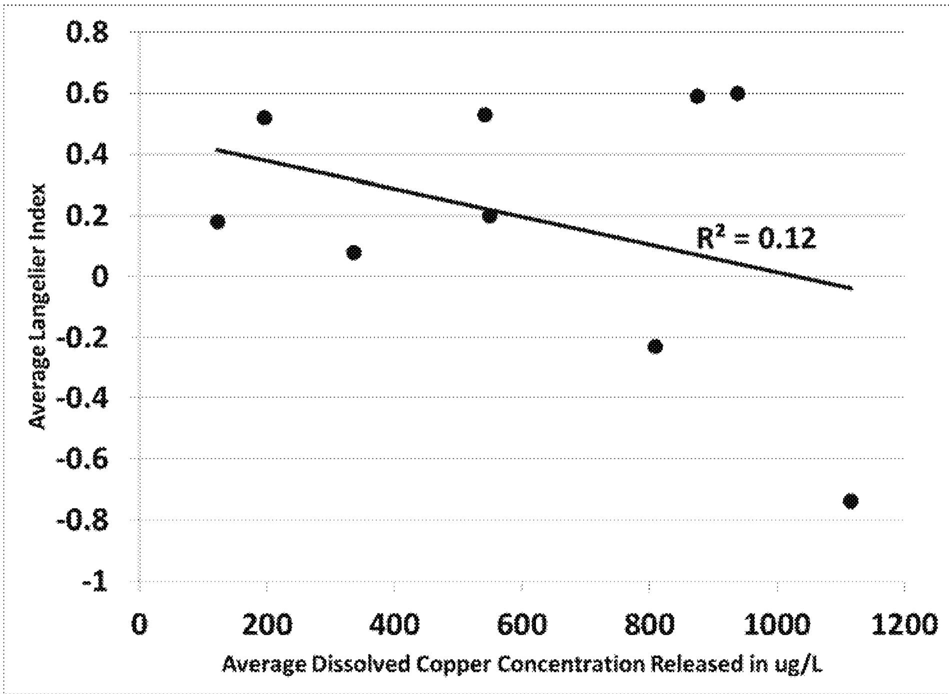


Figure 7.10 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water compared to the Langelier Index of the flowing system water

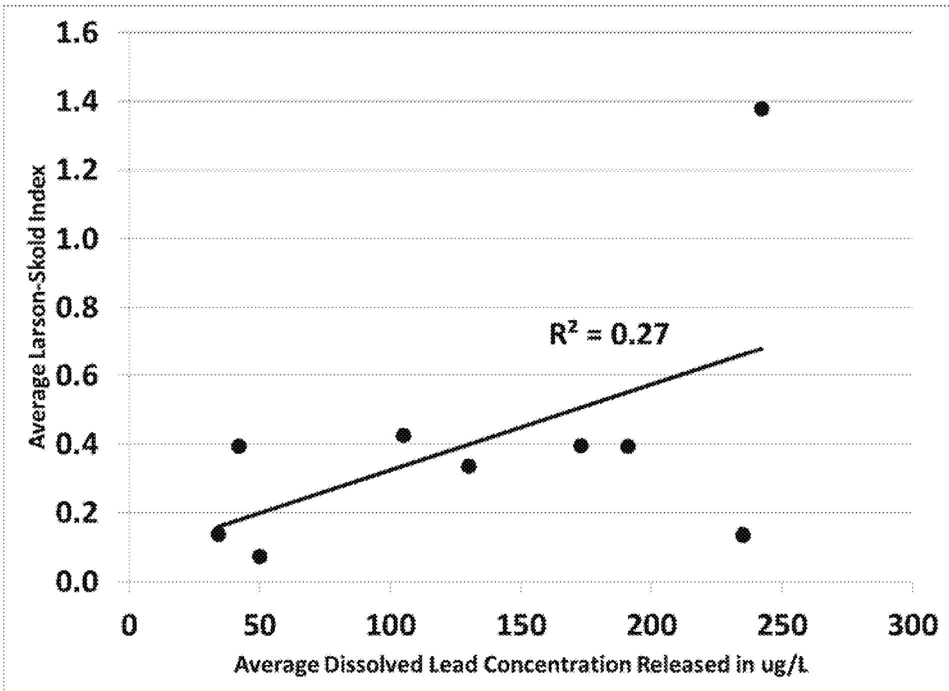


Figure 7.11 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water compared to the Larson-Skold Index of the flowing system water

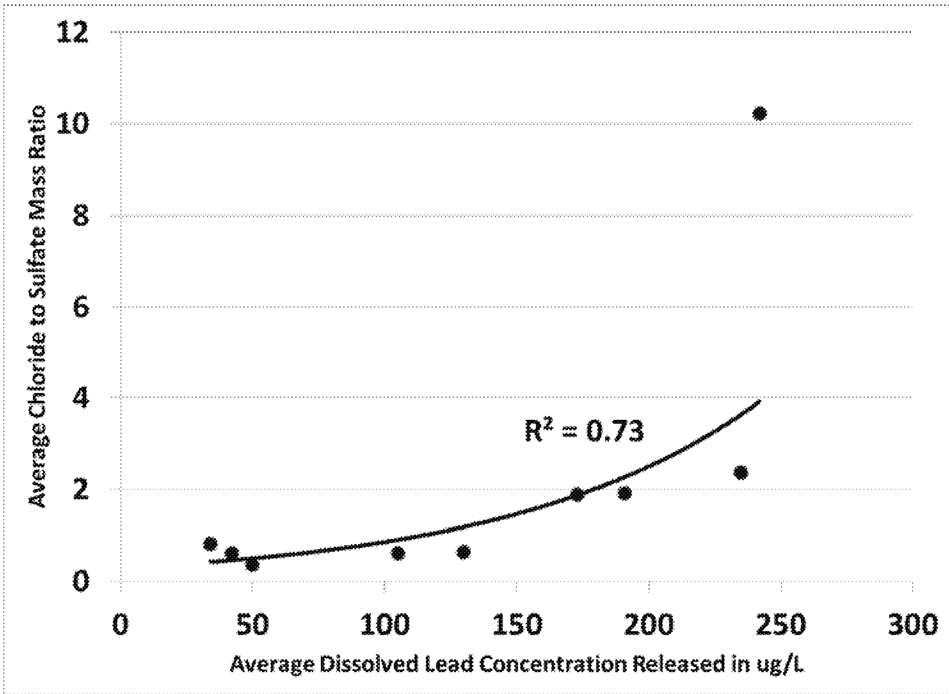


Figure 7.12 Steady state dissolved lead release into PRS monitoring station lead test chamber stagnating water compared to the chloride to sulfate mass ratio in the flowing system water

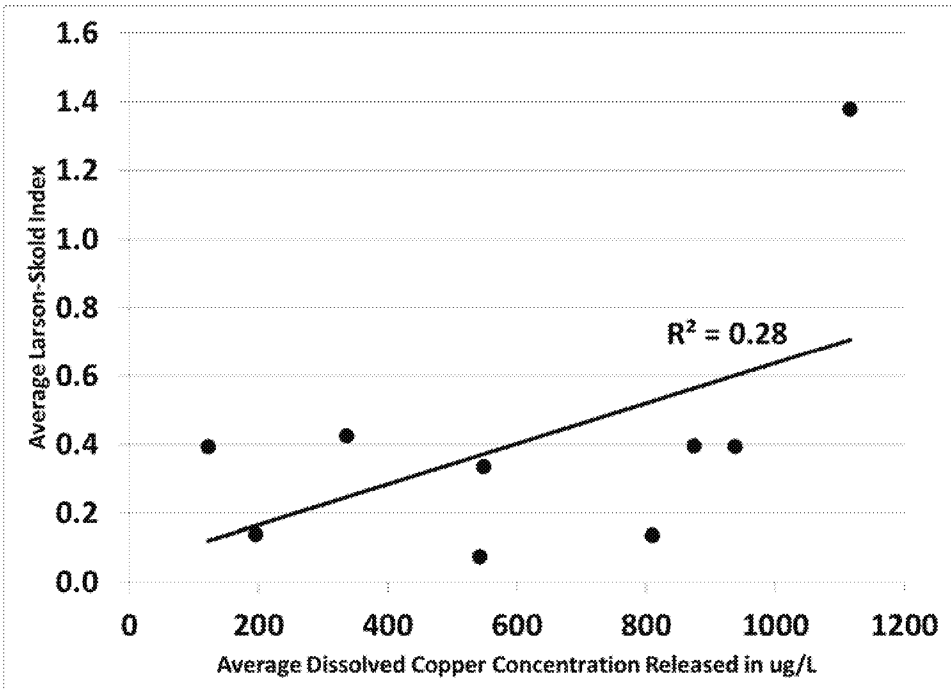


Figure 7.13 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water compared to the Larson-Skold Index in the flowing system water

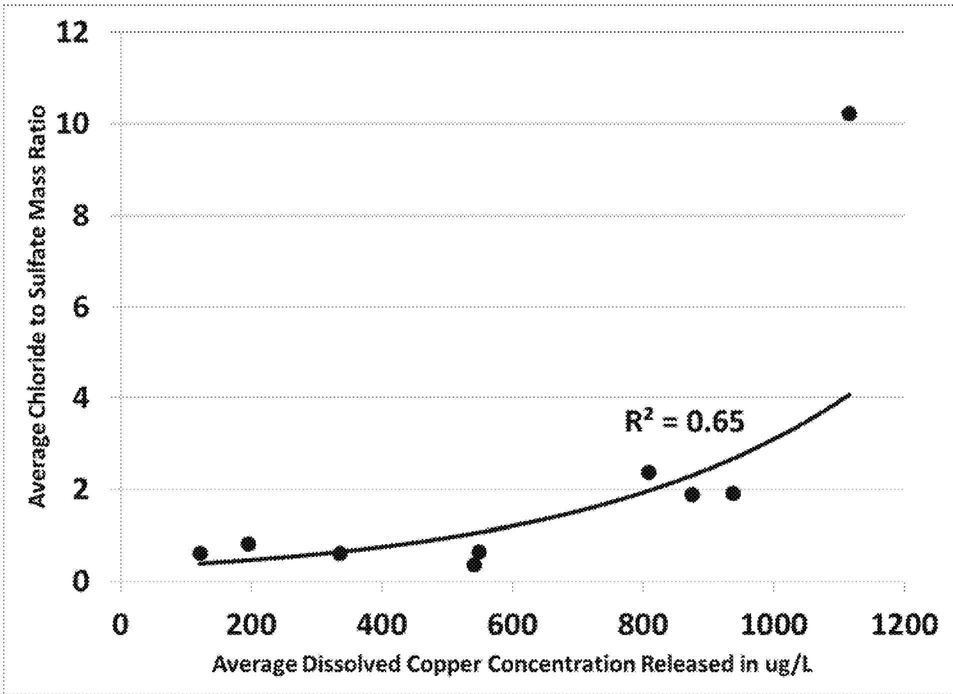


Figure 7.14 Steady state dissolved copper release into PRS monitoring station copper test chamber stagnating water compared to the chloride to sulfate mass ratio in the flowing system water

UNIFORM CORROSION ASPECTS OF THE METAL PLATE SCALES

Carbonate and oxide compounds of lead and copper found on the metal surfaces of the test chamber plates were described in Chapter 6 and Tables 6.9 and 6.10. These compounds are predicted to form using the thermodynamic equilibrium concepts described earlier.

Tables 7.16 and 7.17 list other components found in the scales on the metal plates. Water Systems A, B, and C use the same water source. However, from Table 7.16, Water System C had lower calcium incorporated into its lead plate scales than did Water Systems A and B. Water Systems B and C also had magnesium in the scales. The other water systems with harder water than Water Systems A, B, and C had very little calcium and magnesium in their scales. Water System E had the most calcium and magnesium of all the groundwater systems, but it was undergoing the installation of softeners that sent the characteristics of the system water swinging between hard and soft water.

From Table 7.17, less calcium and more magnesium built up on the copper metal plate surfaces than the lead plates for Water Systems A and B. For the groundwater systems, more calcium built up on copper plates than on the lead plates. Water System E, where influent water fluctuated between soft and hard water, a greater quantity of calcium and magnesium was found in the copper plate scale than on the lead plates. Chloride concentration was also greater on the copper plates than the lead plates for Water System E. Chloride was found on the copper plates of Water Systems A and C in about the same quantity. Water System B had slightly higher chloride content.

Table 7.16
Extraneous elements on PRS monitoring station lead plates by x-ray fluorescence or energy dispersive spectroscopy by weight %

Water System	Ca	Mg	Cl
A	7.99		
B	9.59	1.07	
C	1.85	0.123	0.094
D-yellow area	0.05		
D-blue area	0.57		
D-hydrocerussite	0.07		
D- Cerussite	0.40		
D-Litharge	0.00		
E	0.60	0.06	0.01
F	0.11		
G			
H	0.01		

Table 7.17
Extraneous elements on PRS monitoring station copper plates by x-ray fluorescence or energy dispersive spectroscopy by weight %

Water System	Ca	Mg	Cl
A	2.95	0.50	0.66
B	2.96	0.94	1.04
C	2.29	0.91	0.64
D-lower P area	0.27		
D-higher P area	0.96		
E	2.00	0.85	0.52
F	0.44		
G			
H	0.35		

This is a partial view of the chemical scale composition. It is only the part related to uniform corrosion. Chapter 8 describes the role of phosphorus in the scales. Chapter 9 describes a study of the biofilms that formed. Chapter 10 describes the other metals that composed the chemical scales and can possibly change their physical properties. These metal plates exemplify the complexity of metal surface accumulations.

CORRELATIONS

Water quality parameters were correlated with dissolved and particulate lead and copper release as described in Chapter 5. Results were described in Chapter 6 and Appendix A. The narrative continues here with a focus on uniform corrosion parameters.

For Water System A, there were time periods where the influent water to the monitoring station had higher pH and higher aluminum concentrations. These were times when sulfate concentration in the water was lower. This occurred during warmer weather months when less alum was required at the treatment plant to filter the lake water. The Larson-Skold Index trended with particulate lead released in the lead test chamber. During the colder months when sulfate level and alum use were higher, the Larson-Skold Index was higher and so was the particulate lead. With a higher Larson-Skold Index, increased dissolved lead was expected instead of increased particulate lead. The actual factors that produced the increased particulate lead may or may not be related to increased sulfate concentration; instead it may have something to do with the characteristics of the lake water and the treated lake water during the winter. As an example, there was higher turbidity and particulate iron during the same time period and these parameters also trended with particulate lead release.

In Water System B, conductivity trended with chloride concentration. That follows expectations because chloride is assumed to solubilize metals, creating higher dissolved solids concentration and its increased conductivity.

In Water System C, correlations identified a time period in the late winter and early spring when chloride concentration, nitrite/nitrate concentration, alkalinity, and ORP increased. Increased particulate lead was also measured during that time period.

Water System D received water from two different groups of water sources, swinging back and forth in water characteristics routinely. In Water System D, increased pH and lower alkalinity corresponded with increased nitrite/nitrate, total phosphorus, sulfate, and chloride, and increased dissolved metals. That is, alkalinity trended opposite of dissolved metals release in the test chambers. In this case, pH and alkalinity were indicators of water sources – water from the treatment plant with lower polyphosphate concentration and lower dissolved organic carbon versus water from three untreated wells with higher polyphosphate concentration and more biologically unstable characteristics. The alkalinity and pH were not necessarily dominant controlling factors in metals release.

Water System E also had swings in water characteristics during the monitoring period as water softeners were being installed. In addition, the system iron/manganese removal filter had been rehabilitated just before the monitoring period but had slowly degraded over the monitoring period as displayed by increasing turbidity after the filter. Correlations showed the release of dissolved lead in the lead test chamber increasing when the Larson-Skold Index decreased. This indicated that water softening, which increased the chloride in the water would have been operating when dissolved lead release was lower. When water was not being softened as indicated by lower chloride concentration, sulfate and hardness were higher. Peaks of ammonia and dissolved organic carbon occurred in the unsoftened water. Microbiological populations were higher when dissolved organic carbon was higher. Therefore, the new water softeners may have been acting as a barrier to parameters that could increase microbiologically influenced corrosion of metals. (This is interesting as older water softeners have been found to enhance parameters that increase microbiologically influenced corrosion of metals in past studies of building plumbing by this author).

In Water System F, influent alkalinity ran opposite to influent barium levels and this may have indicated changing water characteristics as the water supply alternated between two wells and water source mixtures. Lead and copper release were not correlated with any uniform corrosion water quality parameter.

No correlations with lead and copper and uniform corrosion parameters were found in Water System G also. Instead, high influent ORP appeared to be correlated with lower microbiological populations in the test chambers.

In Water System H, chloride and sulfate trended together but there were no implications for lead or copper release.

SUMMARY

There is an initial period of lead and copper release after the clean metal plates have been exposed to water where dissolved lead and copper concentrations are high and fall quickly over time. This is most likely a time when carbonate and oxide scales are forming on the metal surfaces as described in the solubility models, inhibiting uniform corrosion as scale coverage increases. The extent that carbonate and oxide scales form are measured by metal plate analysis at the end of each monitoring project.

However, uniform corrosion appears to take a minor role in lead and copper release after that initial time period. The following observations were made on the decreased influence of uniform corrosion after the initial exposure of metal to water:

- Dissolved lead release was not predicted by the carbonate solubility model graphs.
- Dissolved lead release did not show a dependency of dissolved inorganic carbon (DIC).
- Dissolved copper release showed a correspondence to predicted values for low DIC water but greatly diverged at higher DIC concentrations. The correspondence at the low DIC concentrations was called into question when the copper release was shown not to have a dependency on DIC. The prediction may have corresponded by chance especially when correlations with other water quality parameters were taken into account.
- The EPA solubility model appears to use different thermodynamic solubility parameters than other standard solubility models, such as Phreeqc which was used in this study.
- The solubility models assume that the water/metal system is at equilibrium. However, studies of surface scale can show the presence of amorphous, thermodynamically unstable compounds of aluminum, iron, and manganese with their ability to adsorb other contaminants such as lead, copper, radium, or arsenic.
- A diversity of lead and copper compounds form on metal surfaces. There are no models for predicting lead and copper release for such a mixed assemblage.
- Using the Spearman rank correlation and aligned time-series graphs to study trends, there were no common trends found between dissolved or particulate lead or copper and pH or alkalinity.

For chloride and sulfate, there was an exponential functional relationship to Chloride to Sulfate Mass Ratio. But, dissolved lead and copper release showed no dependency, in general, on the Larson-Skold Index where alkalinity is also considered. There were two water systems where lead and copper release did co-trend with the Larson-Skold Index. For Water System A where a pattern of alum use at the water treatment plant trended with a pattern of sulfate in the distribution system, higher particulate lead release trended with sulfate concentration and the Larson-Skold Index. For Water System E, where water characteristics fluctuated between hard and soft water, dissolved lead release was lower when water was being softened and the Larson-Skold Index was higher. Softened water had a higher Larson-Skold Index because of chloride addition from the softener. From these two examples, it can be seen that the index may just represent an operational scenario and not represent chloride or sulfate as a causative factor in lead and copper release.

Calcium carbonate precipitation was shown to not be a factor in lead or copper release as others have stated in the past (AWWA and DVWG 1996).

ORP did not show a direct relationship to lead or copper release. However, correlations tied it to trends with parameters related to biostability. This will be discussed further in Chapter 9.

In summary, uniform corrosion factors appear to be significant in the release of lead and copper when clean metal surfaces are first exposed to water. During this period, compounds of carbonates and oxides develop on the metal surfaces. Over time, other chemical compounds and microbiological products become ingrained in the metal surface debris, bringing other and possibly more significant influencing factors on lead and copper release.

Very important to the discussion of uniform corrosion is that it only deals with dissolved lead and dissolved copper. From Chapter 6, it can be seen that particulate lead and particulate copper can be quite a significant fraction of the total lead and copper that can reach consumers.

CHAPTER 8
THE INFLUENCE OF PHOSPHATE ON CORROSION OF METALS

Orthophosphate-based chemical products are used for lead and copper control as recommended and sometimes required by the Lead and Copper Rule. Orthophosphate ions can form very insoluble compounds with lead and copper and can create barriers on metal surfaces to inhibit the uniform corrosion process.

Water Systems A, C, D, G, and H dose various phosphate products into the drinking water (Table 8.1). In this project, the products used included polyphosphate as well as orthophosphate. Polyphosphate has been used historically in the drinking water industry to sequester iron, manganese, and calcium so that these minerals will not precipitate out on plumbing fixtures (Larson 1957). Much has been written about issues of using polyphosphate, a chemical that holds metals in water, when simultaneously trying to drop out lead or copper as a solid phosphate compound to form a protective barrier on pipe walls (Holm and Schock 1991; AwwaRF and DVGW 1996; Cantor et al. 2000; EPA 2016a). These are two competing interactions. Higher lead and copper concentrations have been found in the water, in some cases, when polyphosphate is present.

Several other types of phosphate products are allowable for lead control under the Rule (AwwaRF and DVGW 1996). There are orthophosphate products, such as phosphoric acid and sodium or potassium salts of orthophosphate. There are zinc orthophosphates which have fallen out of favor because of a negative impact of zinc at the receiving wastewater treatment plants.

Water System A uses a product where 90% of the phosphorus is orthophosphate. The other 10% is polyphosphate. The low polyphosphate fraction was intentional; a 100% orthophosphate product was desired. The product used is safer than using phosphoric acid and is economical. Water System D uses two phosphate products. One product is used on water that is treated for iron and manganese removal. The phosphate product is intended for corrosion control but 80% of that product is polyphosphate. A second phosphate product is used at three wells to sequester iron and manganese; here, the product is 100% polyphosphate. The two water types are routinely mixed in the water system. Water Systems C, G, and H use products that are 60 to 70% polyphosphate for corrosion control.

Table 8.1
Phosphate products used by participating water systems

Water System	Product	% by Wt. as P	% of P as Polyphosphate	% as P as Orthophosphate	Product Wt. in lb/gal
A	LPC-132	32.0	10	90	11.51
B	No phosphate added				
C	Carus 8400	31.7	60	40	11.20
D	Aquadene SK7699	21.0	100	0	11.01
	Aquadene 7543	30.0	80	20	11.51
E	No phosphate added				
F	No phosphate added				
G	LPC-AM	34.5	70	30	11.43
H	AquaMag	34.5	70	30	11.40

ORTHOPHOSPHATE AND POLYPHOSPHATE CONCENTRATIONS AT THE HIGH WATER AGE LOCATION

The dosage of phosphate products can be measured using a field analysis for orthophosphate and is typically expressed as concentration in mg/L as orthophosphate (PO_4). When polyphosphates are present, total phosphorus must be measured and the orthophosphate subtracted. The remainder is composed of more complex forms of phosphorus, such as the polyphosphate concentration. Total phosphorus cannot be analyzed in a field test and must be analyzed in a laboratory using an acid and heat digestion (APHA et al. 1995).

Total phosphorus is expressed in units of mg/L as phosphorus (P). To convert between the units of PO_4 and P in order to subtract the orthophosphate concentration from the total phosphorus concentration, the following formula applies:

$$\text{mg/L as P} = (\text{mg/L as } PO_4)/3.06$$

The conversion factor of 3.06 is the ratio of the molecular weights of PO_4 to P.

Table 8.2 displays the orthophosphate measured in the system water samples at the high water age locations where the PRS Monitoring Stations were located. Orthophosphate was only measured if a phosphate chemical was used in the system. Typical orthophosphate dosages discussed in the literature for lead control are found at 0.3 to 1.0 mg/L as P (0.92 to 3.1 mg/L as PO_4) (Sheiham and Jackson 1981; Gregory and Jackson 1984; Wagner 1989; Colling et al. 1992; Duranceau et al. 1997). Recent research calls for up to 1.14 mg/L as P (3.5 mg/L as PO_4) in order to control lead in a water system (EPA 2016a).

Table 8.2
Orthophosphate concentration in system water at a high water age location in mg/L as PO_4 (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.7	0.7	0.6
B	NA	NA	NA
C	0.2	0.2	0.1
D	2.2	0.8	0
E	NA	NA	NA
F	NA	NA	NA
G	0.9	0.4	0
H1	1.6	1.0	0.4
H2	1.3	0.9	0.5

Table 8.3 displays the total phosphorus measured in the water at the same locations. In this table, total phosphorus is expressed as mg/L as PO_4 so that it can be compared to the orthophosphate fraction measured and listed in Table 8.2.

The difference between the total phosphorus and the orthophosphate concentrations are the complex phosphorus compounds. They can be in organic form or they can be in polymeric form, such as with polyphosphate compounds. In Table 8.4, the orthophosphate concentration in Table 8.2 is subtracted from the total phosphorus concentration in Table 8.3 to calculate the possible polyphosphate concentration.

Table 8.3
Total phosphorus concentration in system water at a high water age location in mg/L as PO_4 (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.9	0.6	0.3
B	0.3	0	0
C	0.3	0.3	0.3
D	0.9	0.3	0
E	3.0	0.6	0
F	0.3	0	0
G	1.2	0.6	0
H1	2.1	1.2	0.3
H2	2.4	1.2	0

Table 8.4
Estimated polyphosphate concentration in system water at a high water age location in mg/L as PO_4 (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.2	0	0
B	NA	NA	NA
C	0.1	0.1	0
D	Unable to calculate because of alternating use of two products		
E	NA	NA	NA
F	NA	NA	NA
G	0.3	0.2	0
H1	0.5	0.2	0
H2	1.1	0.3	0

Table 8.5
Average % orthophosphate at high water age location (PRS monitoring station influent tap)

Water System	% Orthophosphate
A	100 (was originally 90)
B	No Phosphate Added
C	67 (was originally 40)
D	Unable to calculate because of alternating use of two products
E	No Phosphate Added
F	No Phosphate Added
G	67 (was originally 30)
H	79 (was originally 30)

In the water distribution system, the polyphosphate compound breaks apart into orthophosphate ions. Since the water samples studied here were from high water age locations, a decrease of polyphosphate and increase of orthophosphate would be expected at these locations. Table 8.5 shows the average percent orthophosphate measured at the high water age location compared to the percent orthophosphate in the product used.

ORTHOPHOSPHATE CONCENTRATION AT THE ENTRY POINT TO THE DISTRIBUTION SYSTEM

The orthophosphate concentrations at the entry points to the distribution systems varied from the concentrations seen at the high water age locations. Figure 8.1 displays these differences. In Water System A, the dosage dropped from an average of 0.72 to 0.66 mg/L as PO_4. This may be because the product was lost as the water flowed to the high water age location, precipitating out as intended. Water System A also used a product where 90% of the phosphorus was orthophosphate. There was little polyphosphate to break apart and increase the orthophosphate concentration. In the other water systems, orthophosphate concentrations increased from the entry points to the distribution systems to the high water age locations. These systems used products where polyphosphate can revert to orthophosphate and increase the orthophosphate concentration in the distribution system.

ORTHOPHOSPHATE CONCENTRATION OVER THE MONITORING PERIOD

Water Systems G and H modified the phosphate dosing during the monitoring period. Neither of the water systems have lead service lines. Regulators consulting on this project agreed that phosphate dosages could be altered in a water system if there were no lead service lines involved. In addition, both water systems had previously been investigated and found to have microbiological problems initiated in their wells and inoculating the distribution system. The remediation plan was to achieve biologically stable water (discussed in Chapter 9) and to clean existing biofilms and chemical scales from the system. To achieve biologically stable water, nutrients that encourage the growth of microorganisms must be removed from the water and that includes phosphorus. Therefore, the phosphate product dose was cut back slowly over time. Nevertheless, the orthophosphate dose remained measurable at the high water age location.

Figure 8.2 displays the orthophosphate concentration at the high water age locations over the monitoring period. Water Systems A and C showed the natural variation of dosed orthophosphate concentration in the distribution system. Water System D showed wide variability. One reason that the variability occurred was because of the two main sources of water that contributed to the system at different time periods, each water source with a different phosphate product, one with 0% orthophosphate.

PHOSPHORUS FROM BIOFILM SLOUGHING

For Water System G, the phosphate dosing was taken down slowly at first and reached a minimum level around 0.1 mg/L as PO_4, a level which occurred naturally in Water System C dosing. After several months, the orthophosphate concentration jumped back up. This was not because the dosing was increased again. This occurred naturally in the distribution system. It was theorized that the orthophosphate was being released from degrading biofilms; now that the microorganisms were starved of phosphorus and the population could not be supported, microorganisms began to die and biofilm material slough off the pipe wall. Another reason for the increase may have been an operational one. As old product was slowly dosed into the system, the orthophosphate fraction may have increased due to polyphosphate reverting to orthophosphate. In Water System H, there were two levels of phosphate dosing decrease. After each lower level was achieved, the elevated orthophosphate concentration in the distribution system occurred, giving more credibility to the biofilm sloughing theory.

PHOSPHORUS COMPOUNDS IN THE METAL PLATE SCALES

The success of covering metal surfaces with lead or copper phosphate compounds from the addition of a phosphate corrosion control chemical was determined by studying the chemical scales on the PRS Monitoring Station metal plate surfaces after the monitoring period was over. The goal with orthophosphate dosing is to create the mineral, pyromorphite, a lead phosphate compound, on lead surfaces. Table 8.6 shows the pyromorphite found in the lead plate scales. Table 8.7 shows the phosphorus found in both the lead and copper plate scales.

Water System A was very successful. It was the water system with a higher orthophosphate dose and no significant presence of polyphosphate in the water. An “appreciable” quantity of phosphorus was observed on the copper plates by means of x-ray fluorescence. On the lead plates, phosphorus was "exceptionally" high. A predominant mineral determined by x-ray diffraction was pyromorphite, the intended lead phosphate compound. The analyst suggested that lowering the phosphate dose should be considered since "adequate" quantities have been achieved in the developed scale. (That is, Table 8.6 shows pyromorphite as the predominant x-ray diffraction peak on lead plates from Water System A with 86% scale coverage (Table 6.9). (Metal plate analytical report from Dr. J. Barry Maynard in April 2016)

Water System C had a low quantity of phosphorus on lead plates and no significant phosphorus on copper plates.

Water System D had phosphorus on both lead and copper plates. However, the phosphorus was not formed into familiar minerals, such as the desired pyromorphite. Instead, the analyst theorized that the phosphorus on both the lead and copper plates was "bound through adsorption onto amorphous iron oxide or hydroxide." See Figure 8.3.

Water System E formed some pyromorphite, which occurred naturally since a phosphate chemical is not added.

Water System H phosphorus content was very low on the lead plates and was not found on copper plates. This was a system where the phosphate dosage was lowered intentionally. Water System G will be operating its PRS Monitoring Station until December 2017 at which time the metal plates will be studied.

Table 8.6
Major minerals on PRS monitoring station lead plates by x-ray diffraction

Water System	Pyromorphite $Pb_5(PO_4)_3Cl$
A	100
B	no phosphate dosing
C	35
D	none present
E	67 (even though no phosphate dosing)
F	no phosphate dosing
G	Still running PRS Monitoring Station
H	none present

Amounts are percent of largest x-ray diffraction peak for scale minerals

Table 8.7
Phosphorus on PRS monitoring station lead and copper plates by x-ray fluorescence or energy dispersive spectroscopy in weight percent

Water System	Phosphorus on Lead Plates	Phosphorus on Copper Plates
A	9.50	4.66
B	0.31	0.12
C	0.88	0.01
D-yellow area	0.82	2.48
D-blue area	1.09	5.85
D-hydrocerussite	0.83	none
D- Cerussite	0.78	none
D-Litharge	1.68	none
E	0.03	0.38
F	none	none
G	Still running PRS Monitoring Station	
H	0.15	none

EFFECT OF PHOSPHATE ON LEAD AND COPPER RELEASE

In Figure 8.4, the lead and copper release in water systems dosing phosphate are compared to the release in water systems not dosing phosphate. Water systems dosing phosphate did not necessarily have lower dissolved lead or dissolved copper release than the non-phosphate systems. When particulate lead and particulate copper release was considered as seen in the total lead and copper release graphs of Figure 8.4, there also was no advantage to dosing orthophosphate compared to water systems not dosing orthophosphate. It is unknown if particulate lead or copper release would be worse if the orthophosphate was not present.

Water Systems A, D, and H had the highest orthophosphate dosages (Table 8.2) and yet their success at controlling lead and copper release was unpredictable in that the three systems experienced different lead concentrations in the water. In addition, Water System F, a higher alkalinity water system with no phosphate addition, had equally low dissolved lead, dissolved copper, and total copper release as Water System A. Lead and copper release in water systems appeared to be the result of a variety of factors and not just phosphate addition.

CORRELATIONS

No water system showed any correlation of increasing orthophosphate with decreasing lead or copper, dissolved or particulate. That is, no correlation coefficient between lead or copper forms and orthophosphate was less than -0.6.

Sparklines in Appendix A show that dissolved copper in Water System A was lower when orthophosphate increased but the phenomenon was part of a nitrification process that encompassed many water quality parameters; at the same time, dissolved lead increased with the increasing orthophosphate.

Water System D had correlations between increasing influent total phosphorus and a variety of dissolved metals released in both test chambers including dissolved copper from the copper test chamber. This may be a result of using a high polyphosphate percentage in the added phosphate product. It is equally possible that metals-laden phosphate was releasing from pipe walls based on the observation of amorphous iron/phosphorus/carbon compounds on the surfaces of the metal plates (Figure 8.3).

Water System B and E, both systems that do not add phosphorus over the natural levels, showed monitoring station influent total phosphorus trending with released particulate metals in the test chambers. Water System F, which also does not feed phosphorus, showed influent total phosphorus trending with various released dissolved metals in test chambers. Water Systems G and H showed influent total phosphorus trending with release of several particulate and dissolved metals.

Sparklines in Appendix A show dissolved copper increasing with increasing phosphate in Water Systems C, D, and G. Dissolved lead was shown increasing with increasing phosphate in Water Systems A, C, and D. Water System H2 had decreasing dissolved lead with increasing phosphate but there were many other factors shown to be at work as well.

Water Systems C and D showed influent orthophosphate trending oppositely from microbiological populations while orthophosphate and microbiological populations trended together in Water System G.

SUMMARY

With this study of the effect of orthophosphate on controlling lead and copper release, there is no clear picture that the chemical renders a water system safe from corrosion. There are no correlations that tie orthophosphate dosage to the lowering of lead or copper release in the five phosphate-dosing water systems.

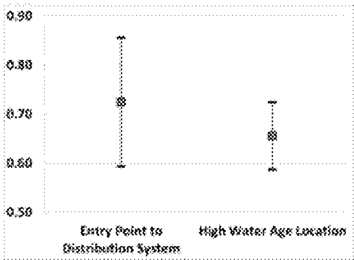
The study of the scales formed when orthophosphate is dosed show that it does not form a perfectly consistent barrier over lead or copper surfaces. Instead, it is woven into a web of scales with many other metals and biofilms, if present at all.

With the exemplary Water System A water quality, one could argue that the higher dosage of orthophosphate and the absence of polyphosphate is required before the chemical can be effective. But even Water System A released an equal quantity of particulate lead as it did dissolved lead, the same particulate lead that had the potential to show up in residences to increase the lead concentration over desired levels (Chapter 3). It is also the same water system where the low released dissolved lead and copper levels were similar in magnitude to a high alkalinity groundwater system not dosing phosphate (Water System F). It is not known to what degree orthophosphate may mute particulate lead release in either Water System A or F.

Nevertheless, the monitoring data in this project give a more complex picture of what shapes water quality than merely being able to apply one chemical to all water systems for corrosion control.

Municipal Lake Michigan Drinking Water Systems

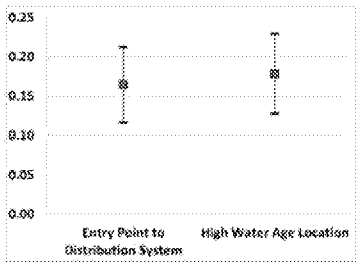
A



B

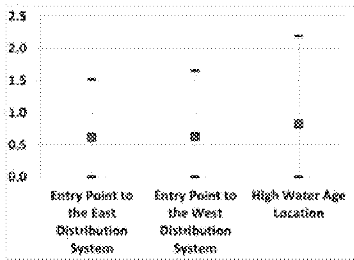
No Phosphate Dosing

C



Municipal Groundwater Drinking Water Systems

D



Campus-Style Potable Groundwater Systems

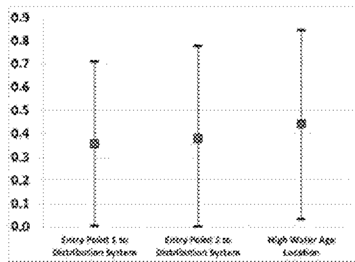
E

No Phosphate Dosing

F

No Phosphate Dosing

G



Campus-Style Potable Groundwater Systems Cont.

H

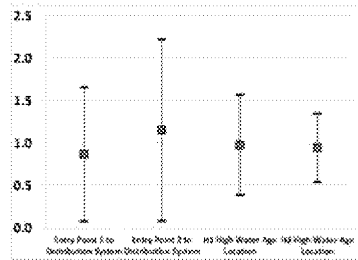


Figure 8.1 Comparison of orthophosphate concentration between the entry points to the distribution systems to the high water age locations in mg/L as PO_4

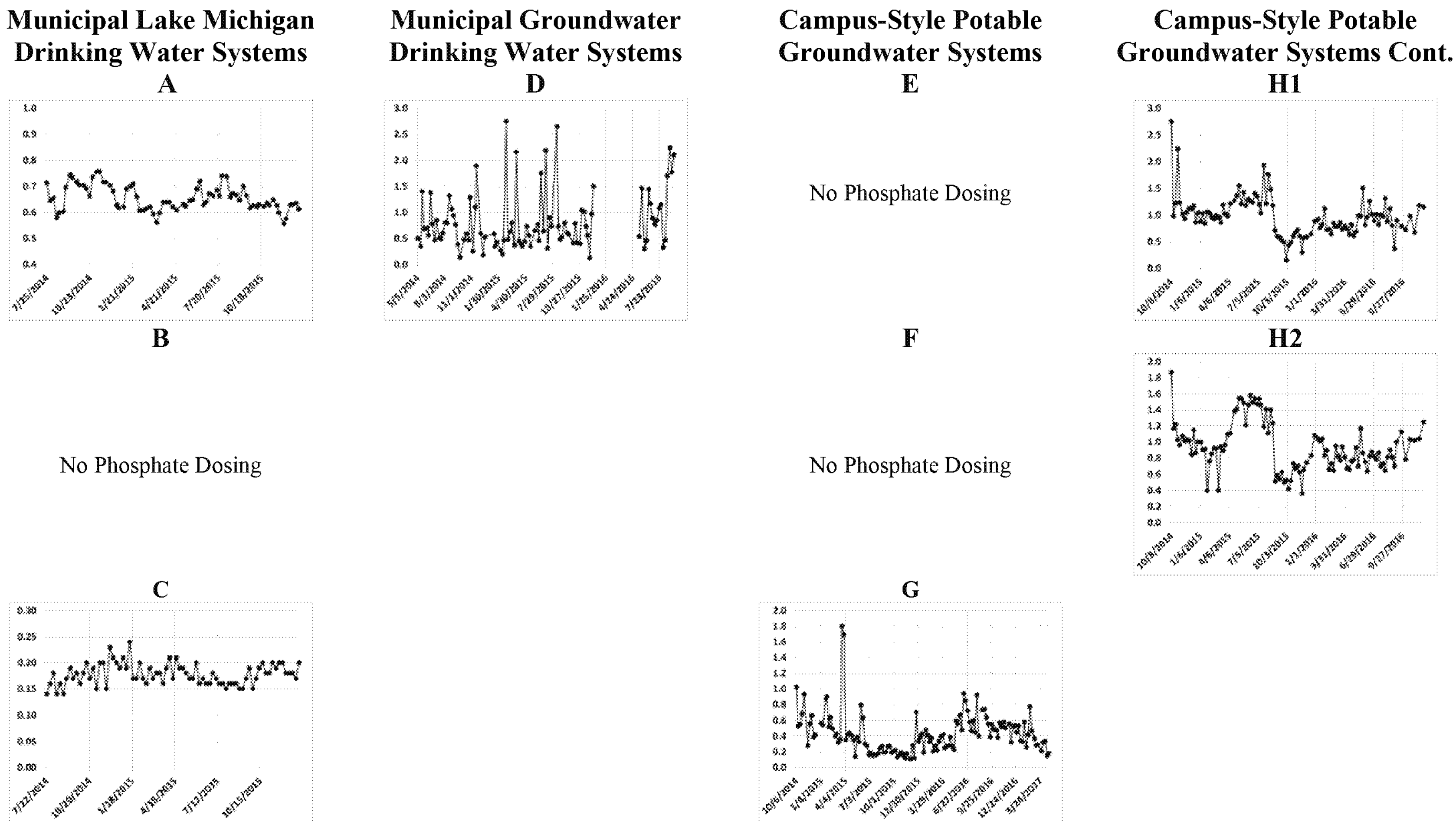
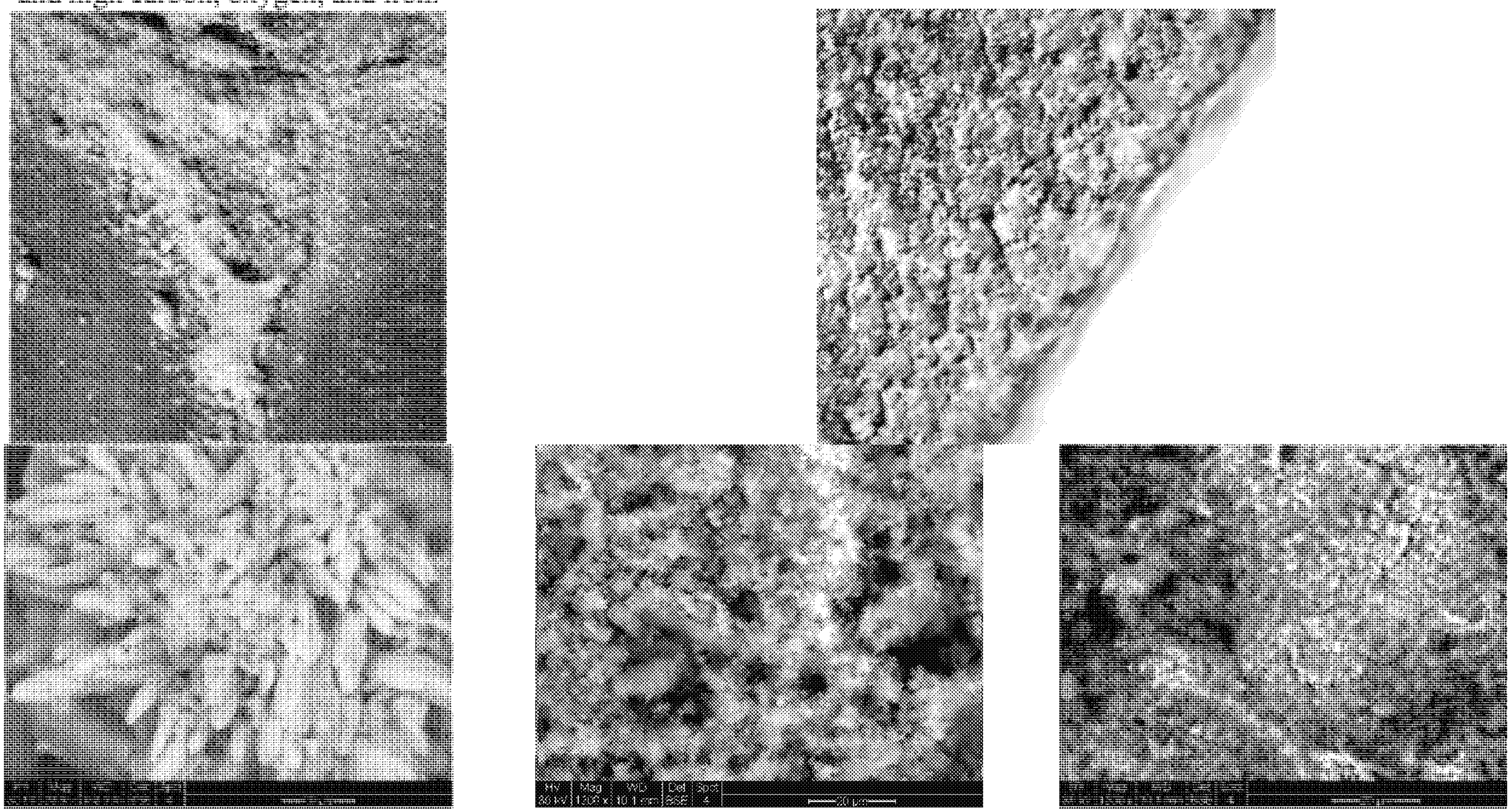


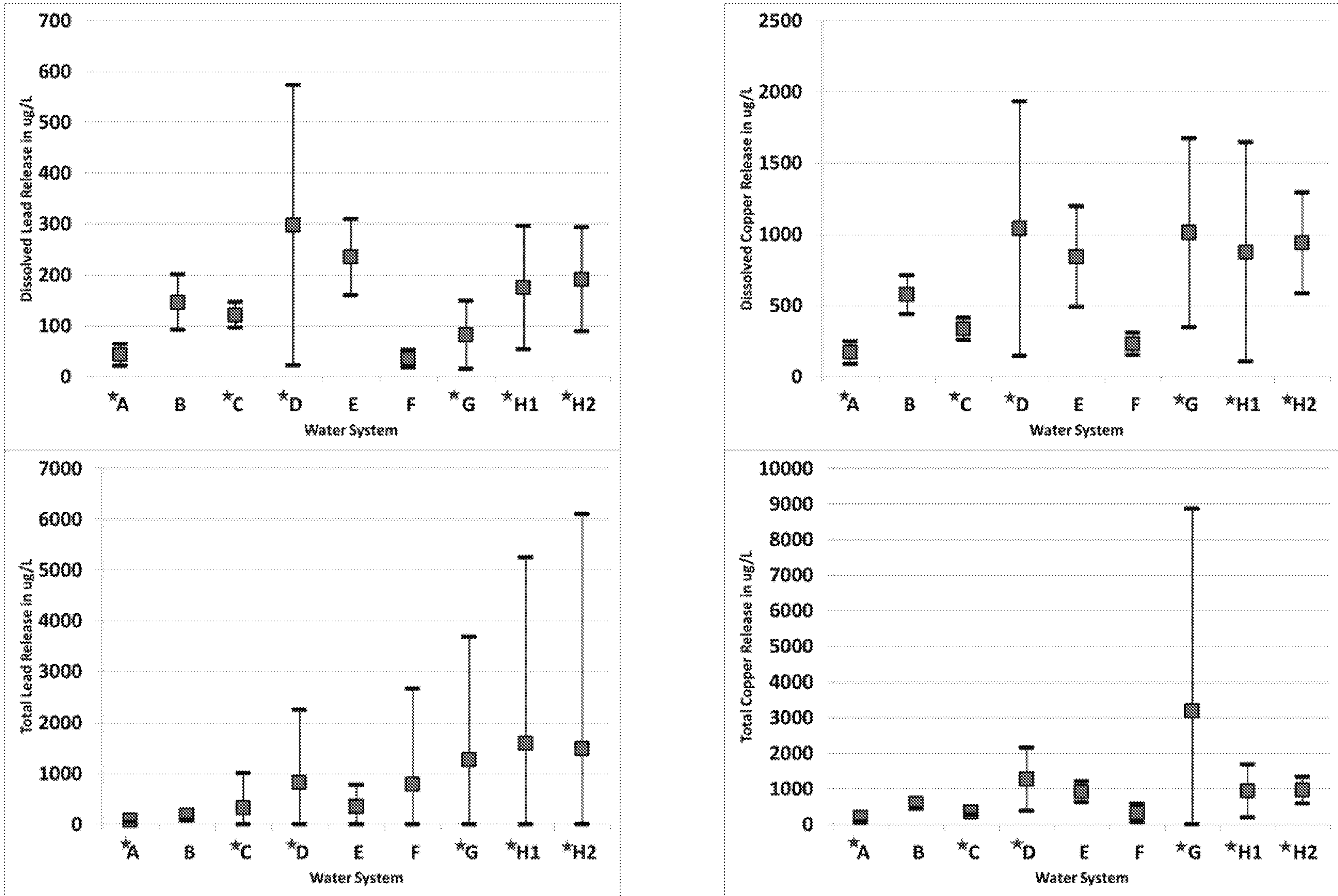
Figure 8.2 Orthophosphate concentration in flowing system water at the high water age locations (PRS monitoring station influent sample tap) over time in mg/L as PO_4

Lead Plates	Copper Plates
A mixture of cylindrical lead carbonate crystals, poorly developed phosphate crystal, and high carbon, oxygen, and iron.	A mixture of copper, phosphorus, carbon, oxygen, and iron



Source: Courtesy of Dr. J. Barry Maynard.

Figure 8.3 Water System D metal plates: Phosphorus bound to amorphous iron compounds



* = Water systems dosing orthophosphate for corrosion control

Total Lead Release = Dissolved lead release + Particulate lead release and the same for copper

Figure 8.4 Comparison of lead and copper release in water systems with and without phosphate dosing

CHAPTER 9
FACTORS RELATED TO BIOSTABILITY AND MICROBIOLOGICALLY INFLUENCED CORROSION OF METALS

Microorganisms are everywhere in the environment – the soil, the air, natural bodies of water - and are carried into water distribution systems. Microorganisms can thrive in water distribution systems, and under certain conditions, they can grow out of control (Bremer et al. 2001).

Several aspects of microbiological growth can cause corrosion of metal surfaces and solubilization of metal compounds. It is known that microorganisms can secrete acidic enzymes to attach to metal surfaces (Bremer et al. 2001) and that such localized acidity can corrode metal surfaces. It is also known that microorganisms can produce acidic waste products, such as hydrogen sulfide from sulfate-reducing bacteria, which forms a weak acid in water (Rittman and McCarty 2001; Madigan and Martinko 2006), another pathway to increased metal corrosion. Nitrifying microorganisms produce nitrates that can form highly soluble compounds of lead and copper and can possibly re-solubilize existing lead and copper films on metals surfaces. It is also known that there are iron-oxidizing bacteria that use electrons from iron and other metals as their food source (Rittman and McCarty 2001; Madigan and Martinko 2006), another pathway by which metal can be oxidized by microorganisms in a water system.

The key to lowering the potential for this microbiologically influenced corrosion is to keep the microbiological populations in balance. Factors that encourage the growth of microorganisms must be balanced against factors that discourage their growth. Successful balancing of factors is called "biostability" (Van der Kooij 1992; Volk and LeChevallier 2000; Zhang et al. 2002; LeChevallier et al. 2015).

In this chapter, measurements of water quality parameters that affect the biostability of the system water are displayed. Trends between biostability parameters and lead and copper release data are studied.

MICROBIOLOGICAL POPULATIONS

A method to quantify microbiological populations is to measure the concentration of adenosine triphosphate (ATP) in the water. ATP is the energy molecule of living organisms. The measured concentration of ATP in the water is somewhat proportional to the number of microorganisms living in the water. The ATP analysis is discussed in Chapter 5.

Only ATP from living microorganisms is captured in the analytical method by means of filtering the living microorganisms out of a water sample. Any ATP previously released from dead microorganisms is discarded in the water. The filtered living microorganisms become the sample to work with. They are exposed to a lysing agent which bursts the cells and releases the ATP into a liquid sample of the lysing agent. Another chemical compound is added to combine with ATP and emit light. The sample is placed in an instrument that can quantify the amount of light emitted and can correlate the measurement with ATP concentration.

Each type of microorganism has its own range of ATP concentrations per organism. As an estimate of microbiological population, an average ATP concentration per organism typically found in drinking water is used: 1000 microbial equivalents (ME) = 1 picogram (pg or trillionth gram) of ATP. While the actual type of microorganisms in the water is not known with this test, it is convenient to express the results as an estimated population number as it is useful for comparing and tracking the severity of microbiological growth in water systems.

A standard of the EPA is to consider less than 500 colony-forming units per mL of microorganisms as acceptable in drinking water as it is representative of enough disinfection to prevent excessive growth of microorganisms in the distribution system (Code of Federal Regulations 2010a). This refers to results of the Heterotrophic Plate Count analysis which only identifies heterotrophic bacteria. However, the test has been used as an indicator of total microbiological activity in water. Now, there is the ATP test that actually measures all microorganisms in the water (except viruses). The standard of achieving less than 500 ME/mL has been transferred to this new test by many practitioners. It becomes a more stringent criterion because all microorganisms are included in the ATP tests, not just the heterotrophic bacteria.

Table 9.1 shows the statistics for the estimated number of microorganisms measured in the system water of the participating water utilities at high water age locations. Very large populations were measured in most of the flowing system water. Only Water System E maintained populations under 500 ME/mL entrained in the system water.

Table 9.1
Microbiological population (ATP) at flowing system water at a high water age location in ME/mL (PRS monitoring station influent tap)

Water System	Highest Expected	Average	Lowest Expected
A	6,356	1,396	0
B	*340,104	64,226	0
C	2,633	733	0
D	8,183	2,087	0
E	157	54	0
F	30,590	7,166	0
G	48,414	8,315	0
H1	1,961	490	0
H2	960	288	0

*High ATP in Water System B influent water may be related to a stagnating influent water line to the monitoring station

Tables 9.2 and 9.3 show the microbiological populations found in the stagnating water of the lead and copper test chambers. Here, the degree that microorganisms grow in stagnating water versus flowing water (Table 9.1) is one indication of the biostability status of the water.

Table 9.2
Microbiological population (ATP) in PRS monitoring station lead test chamber stagnating water in ME/mL

Water System	Highest Expected	Average	Lowest Expected
A	4,431	1,704	0
B	26,069	5,578	0
C	14,351	5,320	0
D	246,193	90,044	0
E	3,813	1,263	0
F	82,688	26,458	0
G	180,714	54,582	0
H1	260,963	50,315	0
H2	266,630	87,025	0

Table 9.3
Microbiological population (ATP) in PRS monitoring station copper test chamber stagnating water in ME/mL

Water System	Highest Expected	Average	Lowest Expected
A	7,924	1,985	0
B	14,981	3,868	0
C	7,406	2,732	0
D	160,395	64,191	0
E	5,794	1,614	0
F	46,382	16,323	0
G	125,624	32,266	0
H1	140,342	24,640	0
H2	274,006	85,175	0

Having a low population of microorganisms entrained in the water, unfortunately, does not insure that excessive microbiological growth is not occurring. The environmental conditions, type of nutrients available, and type of microorganisms predominating in a water system may be more conducive to biofilm formation with little release of microorganisms into the water. Tables 9.4 and 9.5 compare microbiological populations adhering to the metal plates in the test chambers to populations in water flowing into the monitoring station and water stagnating adjacent to the biofilm-laden metal plates. Biofilm quantification on the metal plates was performed at the end of the monitoring period when metal plates could be removed from the test chambers and analyzed.

Table 9.4
Microbiological population (ATP) distributed between the water and the metal surface

Water System	In System Water	On Lead Surface	In Lead Test Chamber Water	On Copper Surface	In Copper Test Chamber Water
Units	**ME/mL**	**ME/cm²**	**ME/mL**	**ME/cm²**	**ME/mL**
A	440	4,000	320	8,800	680
B	2,100	3,220	128	10,200	900
C	350	71,000	920	15,000	430
D	643	522,659	13,640	108,883	8,151
E	40	76,600	600	265,000	1,000
F	115	15,900	1,071	34,100	215
G	Monitoring Station will be operating until December 2017				
H1	470	6,000	49,000	20,000	24,000
H2	280	6,000	85,000	67,000	83,000

From Table 9.4, the potential for biofilm formation can be quite high such as in Water System D. Biofilm formation potential can also vary by type of metal such as in Water System E where biofilm tends to form on copper surfaces versus lead. Biofilms can form and release large populations to the water as in Water System H. Or, biofilms can form and release very few microorganisms to water as in Water System E.

Table 9.5
Microbiological population (ATP) distributed between the water and the metal surface (%)

Water System	On Lead Surface	In Lead Test Chamber Water	On Copper Surface	In Copper Test Chamber Water
A	91.6	8.4	92.2	7.8
B	95.8	4.2	91.1	8.9
C	98.6	1.4	97.0	3.0
D	97.2	2.8	92.3	7.7
E	99.1	0.9	99.6	0.4
F	93.0	7.0	99.3	0.7
G	Monitoring station will be operating until December 2017			
H1	9.5	90.5	42.9	57.1
H2	5.4	94.6	42.2	57.8

Calculations based on data in Table 9.4; metal surface area in test chamber = 854.6 cm^2; volume of water in test chamber = 950 mL

In Table 9.6, it can be seen that microbiological populations in the test chambers are not necessarily equal to the incoming population. Sometimes, there can be an increase in population released from biofilm as in Water System D. There can also be a decrease in population held from the water by the biofilm as in Water System B.

Table 9.6
Microbiological population (ATP) entrained in water relative to influent water population

Water System	In System Water	In Lead Test Chamber Water	In Copper Test Chamber Water
A	1.00	0.73	1.55
B	1.00	0.06	0.43
C	1.00	2.63	1.23
D	1.00	21.21	12.68
E	1.00	15.00	25.00
F	1.00	9.31	1.87
G	Monitoring Station will be operating until December 2017		
H1	1.00	104.26	51.06
H2	1.00	303.57	296.43

Calculations based on data in Table 9.4; all values divided by system water population for each system

NUTRIENTS

In assessing biostability of water, the concentrations of nutrients available for microbiological growth must be monitored. The nutrients required in the largest quantities for microbiological growth are organic carbon compounds, nitrogen compounds, and phosphorus compounds. Tables 9.7 to 9.10 show the measured concentrations of nutrients in system water at a high water age location for the participating water utilities.

Table 9.7
Dissolved organic carbon (DOC) concentration in flowing water at a high water age location in mg/L (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	2.6	1.6	0.6
B	2.7	1.7	0.6
C	3.1	1.7	0.2
D	2.7	1.5	0.4
E	2.2	1.5	0.8
F	0.9	0.6	0.3
G	2.0	0.8	0
H1	1.0	0.6	0.1
H2	1.0	0.6	0.2

Table 9.8
Ammonia (NH_3) concentration in flowing water at a high water age location in mg/L as N (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.3	0.2	0.1
B	0.1	0	0
C	0.1	0	0
D	0.1	0	0
E	0	0	0
F	0.1	0	0
G	1.0	0.2	0
H1	0.1	0	0
H2	0.1	0	0

Table 9.9
Nitrite/nitrate (NO_3+NO_2) concentrations in flowing water at a high water age location in mg/L as N (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.5	0.4	0.3
B	0.5	0.3	0.2
C	0.7	0.4	0.1
D	2.6	1.3	0.1
E	0.1	0	0
F	1.1	0.8	0.5
G	0.1	0.1	0
H1	3.1	2.5	2
H2	3.3	2.6	1.8

Table 9.10
Total phosphorus concentration in flowing water at a high water age location in mg/L as P (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	0.3	0.2	0.1
B	0.1	0	0
C	0.1	0.1	0.1
D	0.3	0.1	0
E	1.0	0.2	0
F	0.1	0	0
G	0.4	0.2	0
H1	0.7	0.4	0.1
H2	0.8	0.4	0

The use of dissociated ammonia by nitrifying bacteria as a nutrient is known as nitrification and is a concern in chloraminated systems. Nitrites and nitrates are the by-products of the nitrification process but can also be broken down by microorganisms for continued microbiological activity. In this project, Water Systems A, B, and C, having the same source water, measured similar concentrations of nitrates and nitrites in the water even though Water System A was the only chloraminated system as seen in Table 9.9. In Table 9.8, only Water System A had slightly higher ammonia concentrations than the other systems.

Several groundwater systems had higher concentrations of nitrates and nitrites than the other systems as seen in Table 9.9. Nitrates can be introduced to water systems as contaminants in the source water. Water Systems D, F, and H experienced the higher nitrate and nitrite compounds.

Phosphorus compounds (Table 9.10) are discussed in Chapter 8. Water Systems A, C, D, G, and H were adding phosphorus compounds to the system water. Water System E received phosphorus in its source water.

DISINFECTION

Factors that can counteract microbiological growth are lowered water age (Bremer et al. 2001) and disinfection (Connell 1996). The PRS Monitoring Stations exaggerate increased water age to magnify chemical and microbiological interactions with the water. The extreme condition puts disinfection to the test of controlling microbiological growth. Table 9.11 lists the total disinfection chemical arriving in the flowing system water at the PRS Monitoring Station. Table 9.12 lists the concentration of the disinfection chemical that is available to fight microorganisms. For any disinfection chemical, appropriate dosing must be set by studying biostability data. For chloraminated systems, the minimum dose is typically 1 mg/L total chlorine. For the free chlorine systems, anecdotally, a minimum disinfection concentration of 0.3 mg/L free chlorine is desired. Water Systems C and D averaged disinfection concentrations <0.3 mg/L

Table 9.11
Total chlorine concentration in flowing water at high water age location in mg/L (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	1.8	1.6	1.3
B	0.8	0.6	0.4
C	0.6	0.4	0.2
D	0.4	0.1	0
E	1.3	0.6	0
F	0.7	0.3	0
G	1.3	0.4	0
H1	1.0	0.6	0.3
H2	1.0	0.5	0

Table 9.12
Active disinfection concentration in flowing water at high water age location in mg/L (PRS monitoring station influent tap)

Water System	Active Disinfection	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	Monochloramine	1.7	1.5	1.3
B	Free Chlorine	0.7	0.5	0.3
C	Free Chlorine	0.4	0.2	0.1
D	Free Chlorine	0.3	0.1	0
E	Free Chlorine	1.2	0.6	0
F	Free Chlorine	0.7	0.3	0
G	Free Chlorine	1.1	0.4	0
H1	Free Chlorine	0.9	0.6	0.3
H2	Free Chlorine	0.9	0.4	0

ENVIRONMENTAL CONDITIONS

Microbiological life cycles can be affected by or can influence the water environment conditions. Increasing water temperature is typically conducive to increasing microbiological populations. The pH of the water can determine the effectiveness of a disinfection chemical as a disinfectant (Connell 1996). The pH of the water can also be decreased by microbiological activity (as in sulfide production) or increased (as in the use of entrained carbon dioxide as a source of carbon). The ORP of the water may indicate that disinfection, an oxidant, is plentiful and microorganisms have a low potential for growth. Or, a dropping ORP can indicate that microorganisms have outgrown the capabilities of the disinfection and have created a reducing environment.

CORRELATIONS

Trends in the water quality parameters related to biostability (ATP, dissolved organic carbon, ammonia, nitrite/nitrate, total phosphorus, total chlorine, and free chlorine/monochloramine) were compared to other water quality parameters in the system water and the test chamber lead and copper release. This was discussed in Chapter 6 and in Appendix A. In each water system, dissolved and sometimes particulate lead and copper release trended with either microbiological populations or microbiological nutrients or both.

SUMMARY OF OBSERVATIONS

The trending study -- correlation calculations along with the water quality parameter graph comparisons -- revealed complex relationships with lead and copper release. One major complexity is that many water quality parameters play a role in both chemical reactions and microbiological life cycles. It is difficult to discern which role they are participating in or if they are participating in both roles simultaneously.

For example, total phosphorus concentration can provide orthophosphate to create lead and copper phosphate corrosion barriers on pipe walls (particulate lead and copper outside of the system water flow). It can provide polyphosphate compounds which can hold lead and copper in the water (dissolved lead and copper in the system water). Or, the phosphorus can be used as food for microbiological growth with subsequent corrosion of piping material through several possible pathways (dissolved or particulate lead and copper in the system water or intertwined with pipe wall debris).

In addition, the water quality parameter may just be an artifact of a system operational event. The phosphorus concentration may be a characteristic of sloughing biofilms from pipe walls during a cleaning action that may coincide with lowered lead or copper.

A high ORP may indicate a highly oxidative water environment that lowers lead release by forming a highly insoluble form of lead oxide on pipe walls. And, a high ORP may indicate a highly oxidative water environment where microorganisms cannot survive and microbiologically influenced corrosion with subsequent lead or copper release cannot occur.

Similar contrasting lists can be developed for other water quality parameters such as nitrate, pH, and alkalinity.

Another aspect of the trending study is the focus it brings on nitrification in distribution systems. Water System A was the only chloraminated water system. Many water quality parameters, including some aspects of lead and copper release, appeared to be related to seasonal fluctuations of nitrification cycles with cycles of ammonia release, followed by an increase in microbiological population and dissolved organic carbon, and subsequent increases in nitrate and nitrite culminating in autumnal maximum concentrations. In water systems with naturally low levels of ammonia, the nitrification process appeared to occur to varying degrees, with repercussions with lead and copper release.

What is known from viewing these complexities is that microorganisms exist in the system water and live on the piping surfaces. The microorganisms and/or their nutrients and waste products coincide with the release of lead and copper and other metals in both dissolved and particulate forms. The water system nutrient concentrations, water age, and disinfection levels all determine the potential for microbiologically influenced corrosion to occur throughout the distribution system. These are the parameters that determine the biostability of the water, that is, the potential for microorganisms to grow excessively. The biostability parameters pervade a distribution system just as other water quality parameters, such as alkalinity and pH, do. Therefore, the biostability of water cannot be ignored as a systemic significant and intertwined factor in the control of lead and copper.

CHAPTER 10
FACTORS RELATED TO CHEMICAL SCALE FORMATION AND DISSOLUTION AND THEIR INFLUENCE ON METAL TRANSPORT IN WATER SYSTEMS

In this project, a number of metals were studied to determine how their dissolved and particulate forms trended with dissolved and particulate lead and copper release. As in Chapter 6 with lead and copper, other metals are presented here by showing:

- The concentrations of the total metals in flowing system water at a high water age location (the PRS Monitoring Station Influent Tap),
- The concentrations of the dissolved and particulate fractions of metals released from scales in the stagnating PRS Monitoring Station test chambers
- The metals' average and variation (expected concentration range) in the test chambers

Metals were organized in groups of commonality for discussion.

ADSORBING AND TRANSPORTING METALS

Aluminum, iron, and manganese have been found to be significant in distribution systems for adsorbing lead and copper and other metals, accumulating them in their scales, and then transporting the metals to consumers' taps when the scales crumble (Schock et al. 2014). These metals can be found to occur naturally in source water. They can also be components of water treatment chemicals. A third pathway into the drinking water is through corroding metal components in the water system; they are part of typical water system materials of construction.

Tables 10.1 to 10.3 display the concentrations of aluminum, iron, and manganese in the flowing system water where the water was sampled at the high water age location of the PRS Monitoring Station. Aluminum is higher in the Lake Michigan water systems compared to the groundwater systems; each of the Lake Michigan systems use an aluminum-based coagulant before filtration. Water System A (88 µg/L average) and Water System C (33 µg/L average) use aluminum sulfate as a coagulant. Water System B (13 µg/L average) uses polyaluminum hydroxychloride. Aluminum concentrations in the groundwater systems are from the source water and piping material contributions and average between 7 and 10 µg/L.

Iron in the system water at the Lake Michigan water systems was around 100 µg/L, the limit of detection at the laboratory. The groundwater systems, all of which had been found to have microbiologically influenced corrosion occurring in the wells, produced an iron concentration in the system that averaged as much as 350 µg/L. The upper expected range of concentrations in Water Systems D and G approached 1000 µg/L. Water System E had low iron concentrations because of a water system iron removal filter plus water softening in individual buildings which can also remove iron.

Manganese in the system water at the Lake Michigan water systems averaged around 2 µg/L. For the groundwater systems, the highest average manganese concentration was 150 µg/L which could reach an upper expected range of close to 300 µg/L.

Figures 10.1 to 10.6 show the tendency of aluminum, iron, and manganese to be either in dissolved or particulate form when released from pipe wall scale. Samples were taken from the stagnating water in the PRS Monitoring Station test chambers. Water Systems A and C, which used alum as a coagulant, had a specific pattern of aluminum concentration. Water System B, using the same source water, used a different coagulant which also includes aluminum. For groundwater systems, aluminum was not significant in the system water with the exception of Water System G. Water System G demonstrated a general presence of a variety of metals.

Table 10.1
Comparison of aluminum in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	160	88	13
B	22	13	3.3
C	47	33	18
D	9.4	8.9	8.4
E	16	11	6.2
F	8.6	8.2	7.8
G	7.8	7.4	7.0
H1	10	8.3	6.1
H2	8.5	8.0	7.5

Table 10.2
Comparison of iron in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	140	120	90
B	260	130	0
C	<100	<100	<100
D	1000	330	0
E	<100	<100	<100
F	350	190	40
G	870	350	0
H1	77	68	58
H2	95	71	47

Table 10.3
Comparison of manganese in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	4.5	3.1	1.7
B	6.1	1.9	0
C	<1.0	<1.0	<1.0
D	270	150	33
E	50	16	0.0
F	14	7.2	0.7
G	180	94	12
H1	3.5	1.8	0.1
H2	5.9	2.5	0

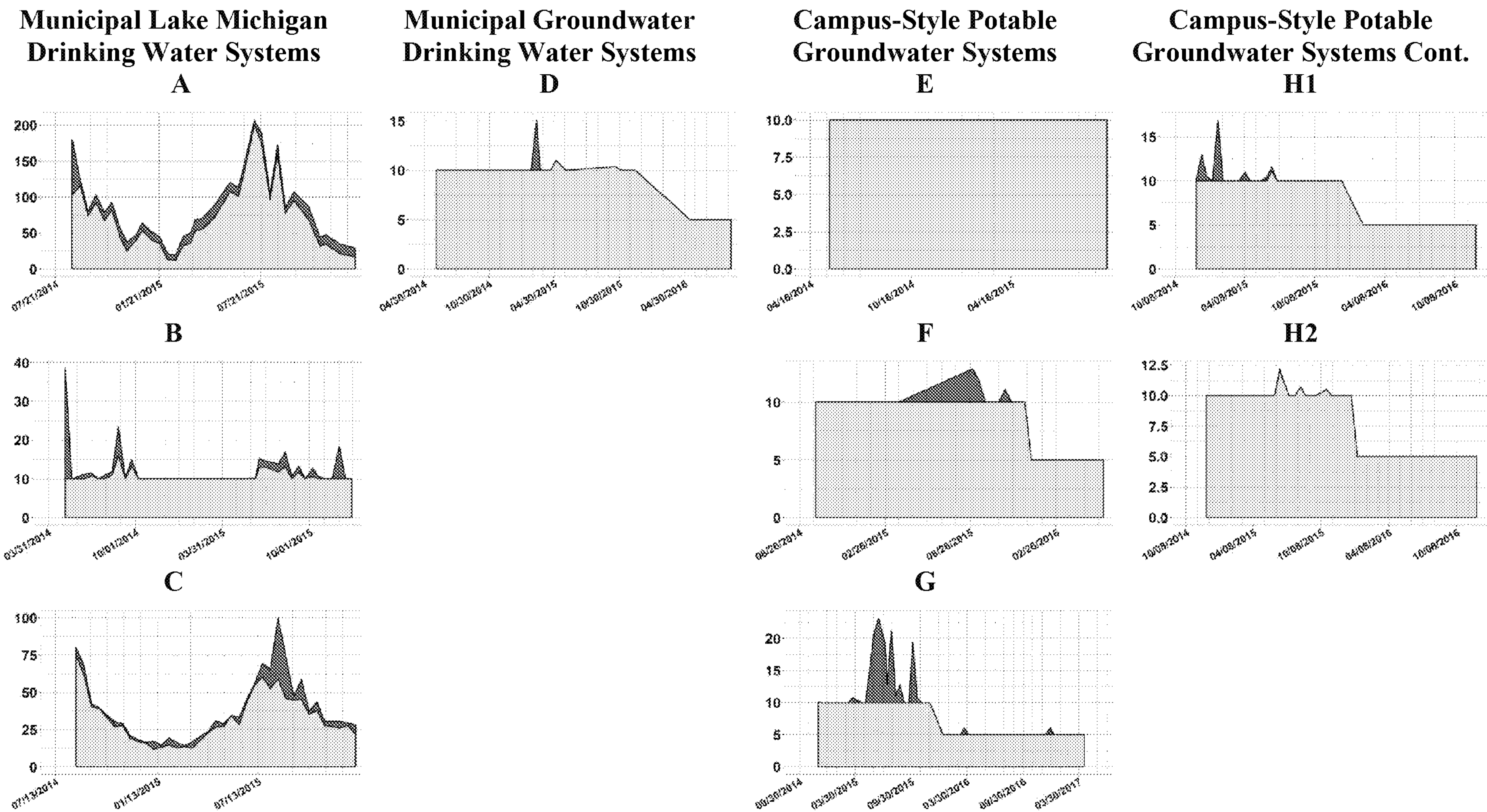


Figure 10.1 Aluminum released into PRS monitoring station lead test chamber stagnating water in µg/L

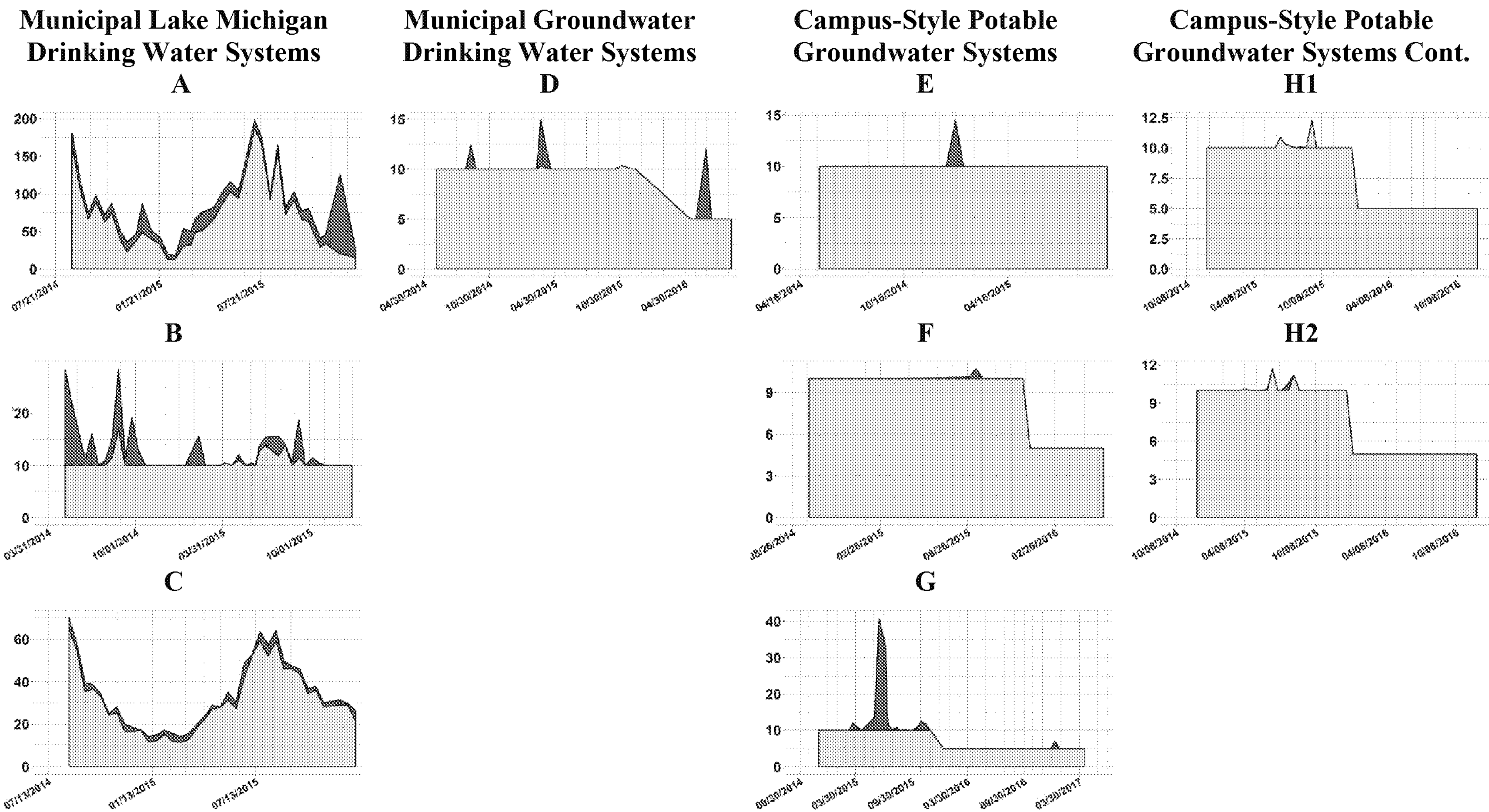


Figure 10.2 Aluminum released into PRS monitoring station copper test chamber stagnating water in µg/L

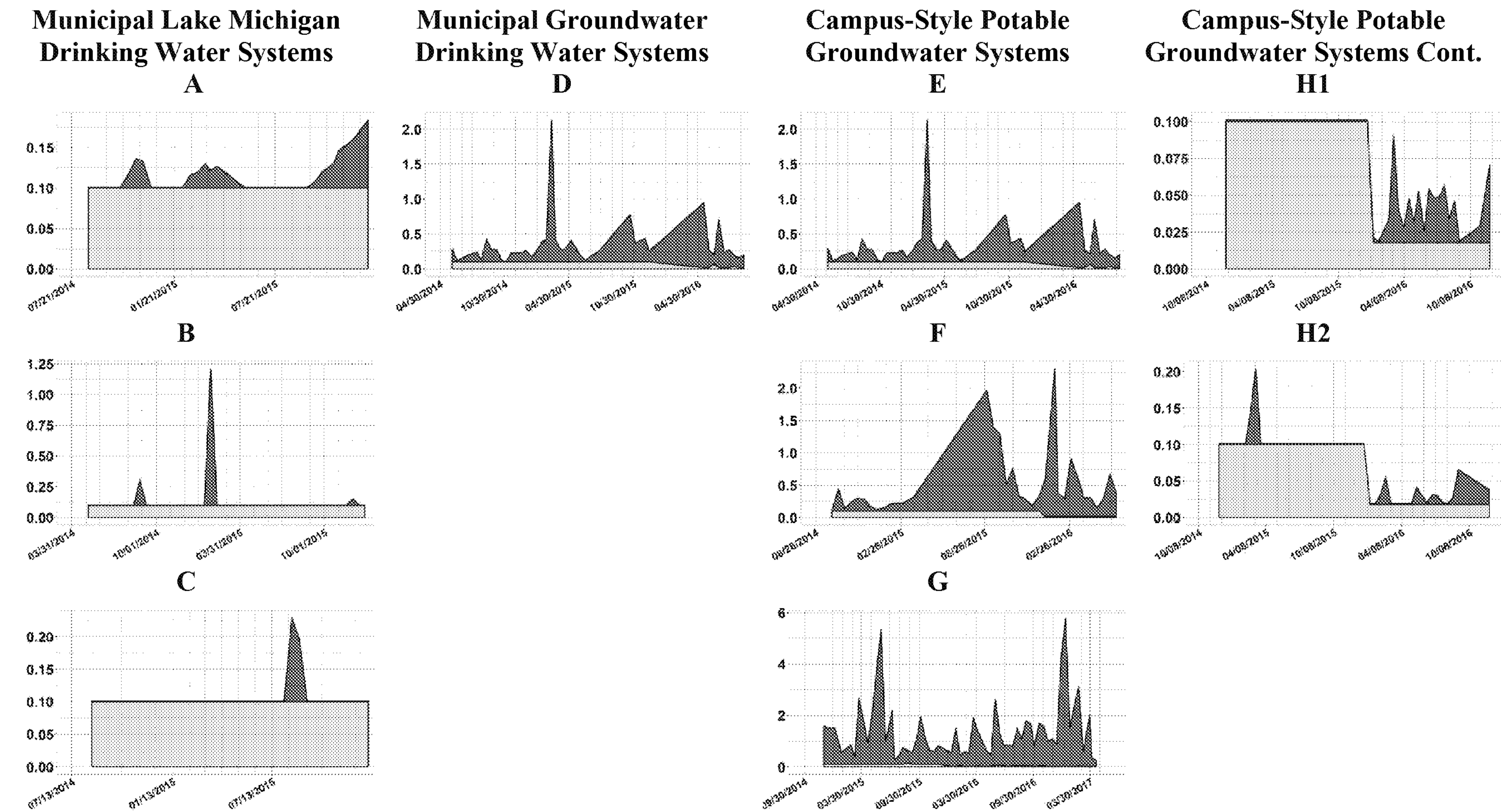


Figure 10.3 Iron released into PRS monitoring station lead test chamber stagnating water in mg/L

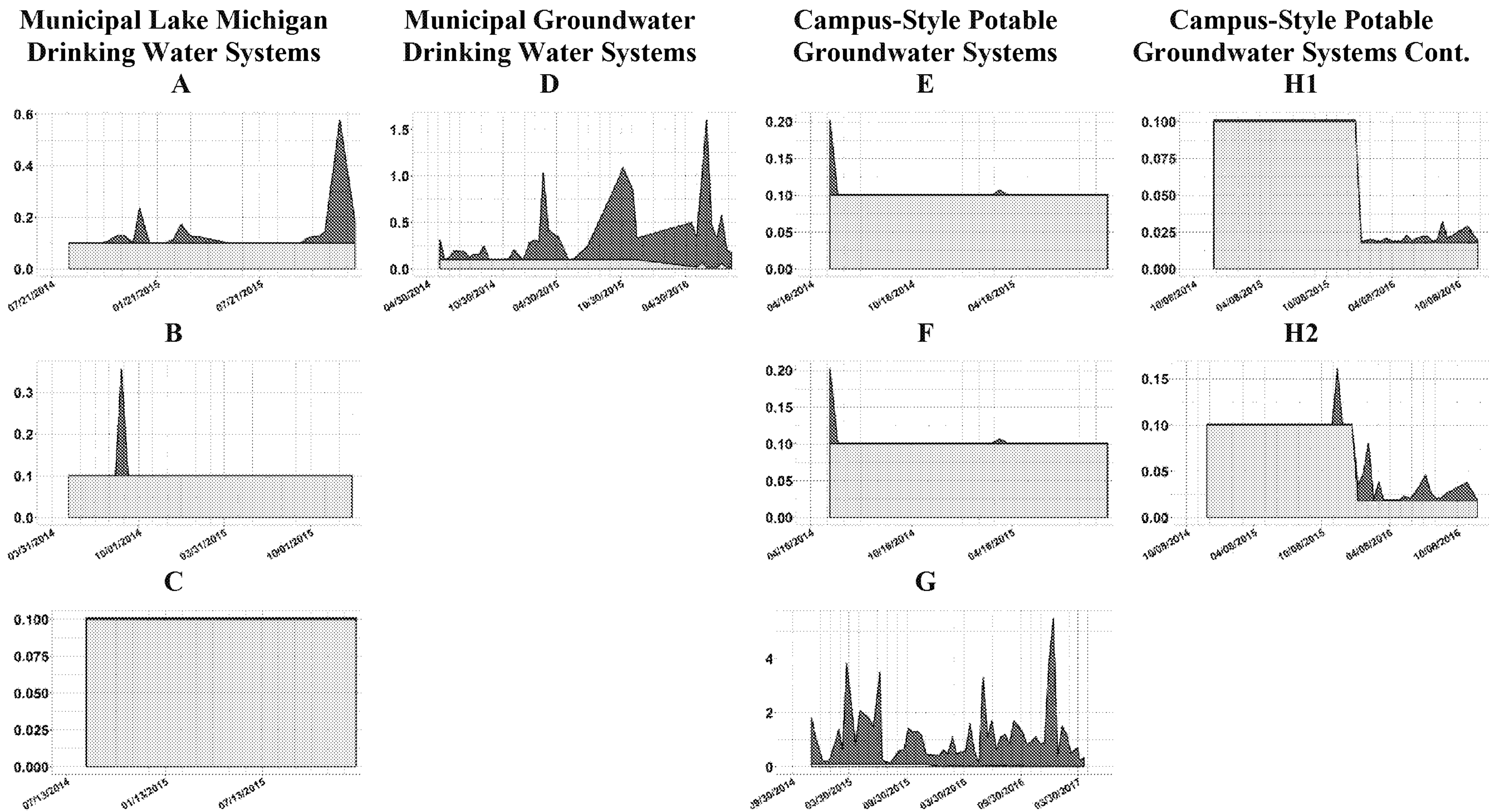


Figure 10.4 Iron released into PRS monitoring station copper test chamber stagnating water in mg/L

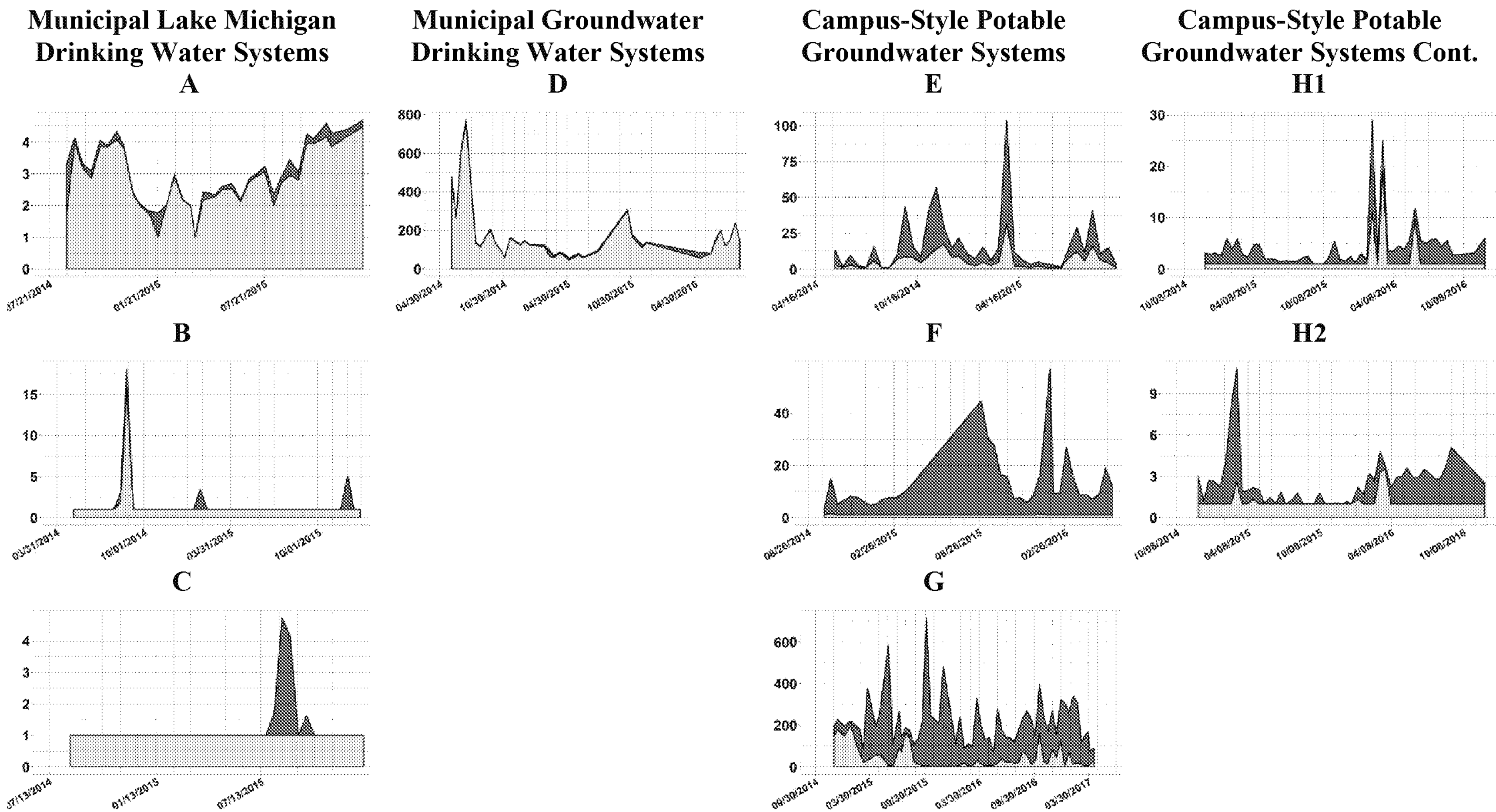


Figure 10.5 Manganese released into PRS monitoring station lead test chamber stagnating water in µg/L

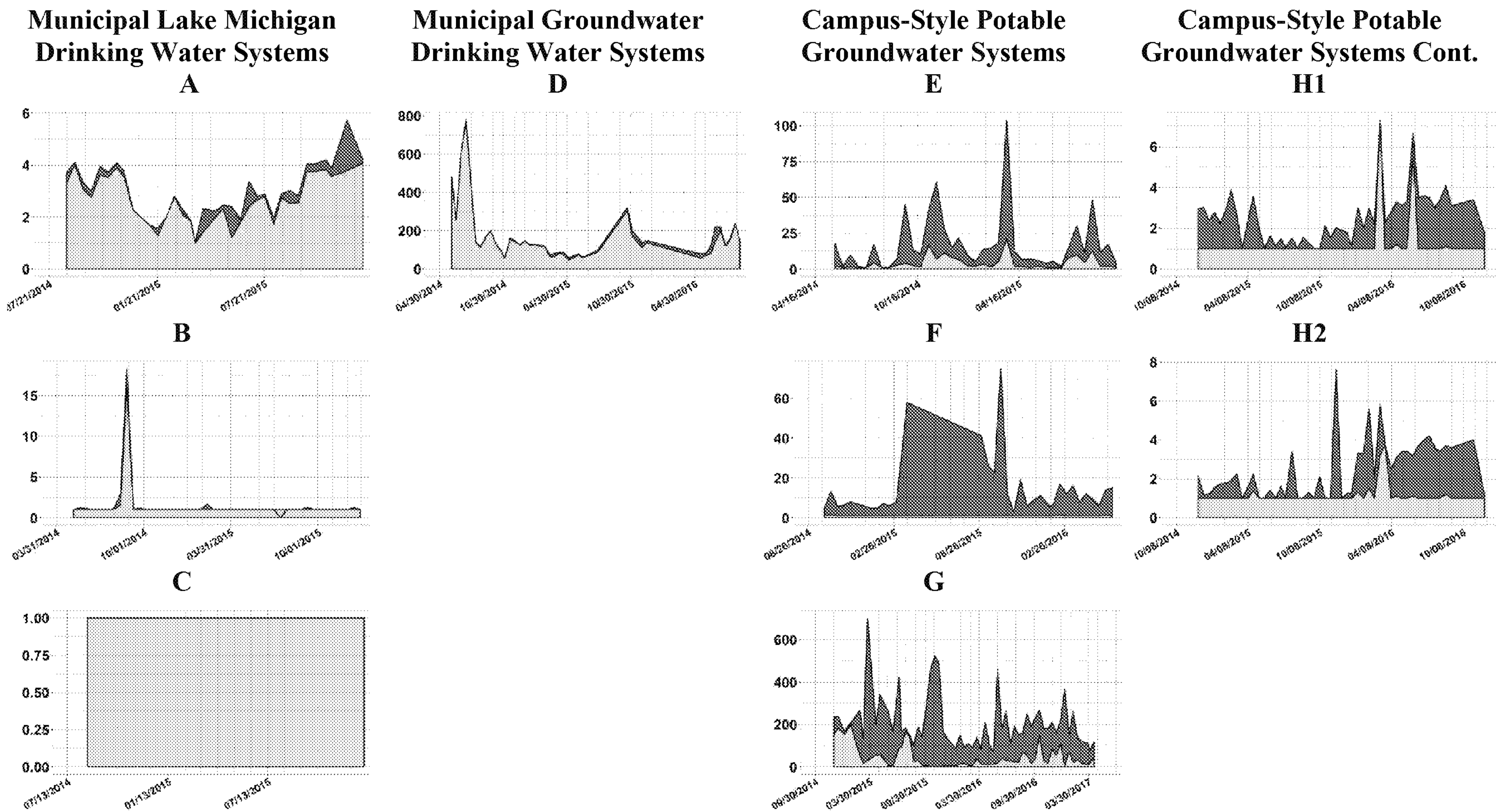


Figure 10.6 Manganese released into PRS monitoring station copper test chamber stagnating water in µg/L

For iron, the laboratory limit of detection was too high to see the variation of the iron at lower levels. For the water systems that were still monitoring when the laboratory was changed, such as Water System H, the variation of iron release can be seen at the lower limit of detection and used in correlations between water quality parameters. Iron release was the most dramatic in Water Systems D and G and sometimes F. Lake Michigan Water System A exhibited a high degree of particulate iron release compared to the other Lake Michigan systems. Particulate manganese was significant in the groundwater systems.

Tables 10.4 to 10.6 lists the average values of the metals in dissolved and particulate form found in the stagnating test chamber water and their typical variations.

PLUMBING RELATED METALS

Plumbing related metals that can be corroded and become dissolved or entrained in the system water were studied. Cadmium, chromium, cobalt, nickel, tin, and zinc were analyzed. They were not found to be significant except for the patterns of nickel and zinc.

Water system concentrations are shown in Tables 10.7 and 10.8. Released concentrations for nickel and zinc are shown in Figures 10.7 to 10.10. Statistics for the released metals are shown in Tables 10.9 and 10.10.

NATURAL HARDNESS RELATED MINERALS

Minerals related to water hardness and water softening were also studied (calcium, magnesium, barium, strontium, sodium, and potassium).

Calcium and magnesium are presented here. System water concentrations are shown in Tables 10.11 and 10.12. Released calcium and magnesium in the test chambers are shown in Figures 10.11 to 10.14. Tables 10.13 and 10.14 list the statistics for released calcium and magnesium.

From the tables and figures, it is seen that calcium and magnesium were mostly in dissolved form in all water systems. Alkalinity, pH, and temperature are major water quality parameters that control the formation of particulate calcium and magnesium. This was discussed in Chapter 7 regarding the calcium carbonate precipitation potential and the Langelier Index. Water systems cannot tolerate excessive precipitation of these minerals because of the potential for clogging piping, valves, and meters. In Water System E, the water was softened after it entered each building. The monitoring took place during a time that new softeners were being installed, so there were times that water was by-passing the softeners and hard water reached the PRS Monitoring Station.

OTHER SOURCE WATER METALS

Vanadium and arsenic were also studied. Water System G had previously had an issue with elevated arsenic in the groundwater. This problem was addressed when the wells were rehabilitated in association with this project. During monitoring, the average arsenic concentration in the flowing system water was measured at 5.8 µg/L. See Table 10.15 to compare Water System G to the other water systems.

Table 10.4
Aluminum released into PRS monitoring station test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
Copper Test Chamber: Particulate Aluminum			
A	43	16	0
B	8.8	2.2	0
C	6.8	2.6	0
D	1.8	0.40	0
E	0.79	0.12	0
F	0.15	0.03	0
G	5.7	1.5	0
H1	0.02	0	0
H2	0.11	0.02	0
Copper Test Chamber: Dissolved Aluminum			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	134	70	6.4
B	13	11	8.5
C	45	31	18
D	9.6	9.0	8.5
E	10	10	10
F	8.8	8.3	7.9
G	7.6	7.3	7.0
H1	8.7	8.0	7.3
H2	8.8	8.1	7.3
Lead Test Chamber: Particulate Aluminum			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	26	13	0.59
B	6.7	1.5	0
C	19	5.4	0
D	0.99	0.15	0
E	0	0	0
F	0.87	0.18	0
G	5.3	1.3	0
H1	1.8	0.28	0
H2	0.03	0.01	0
Lead Test Chamber: Dissolved Aluminum			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	137	73	8.2
B	13	11	8.4
C	47	33	18
D	9.7	9.0	8.4
E	10	10	10
F	8.8	8.3	7.9
G	7.6	7.3	7.1
H1	8.1	8.0	7.8
H2	9.0	8.2	7.4

Table 10.5
Iron released into PRS monitoring station test chamber stagnating water in mg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
Copper Test Chamber: Particulate Iron			
A	0.14	0.03	0
B	0.04	0.01	0
C	0	0	0
D	0.85	0.29	0
E	0.01	0	0
F	1.2	0.35	0
G	3.0	1.0	0
H1	0.01	0	0
H2	0.03	0.01	0
Copper Test Chamber: Dissolved Iron			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.10	0.10	0.10
B	0.10	0.10	0.10
C	0.10	0.10	0.10
D	0.10	0.08	0.06
E	0.10	0.10	0.10
F	0.08	0.07	0.06
G	0.08	0.06	0.04
H1	0.07	0.07	0.06
H2	0.07	0.07	0.06
Lead Test Chamber: Particulate Iron			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.03	0.01	0
B	0.21	0.03	0
C	0.03	0.01	0
D	0.93	0.26	0
E	0.01	0	0
F	1.4	0.43	0
G	3.2	1.2	0
H1	0.03	0.01	0
H2	0.03	0.01	0
Lead Test Chamber: Dissolved Iron			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.10	0.10	0.10
B	0.10	0.10	0.10
C	0.10	0.10	0.10
D	0.10	0.08	0.07
E	0.10	0.10	0.10
F	0.08	0.07	0.06
G	0.10	0.06	0.03
H1	0.07	0.07	0.06
H2	0.07	0.07	0.06

Table 10.6
Manganese released into PRS monitoring station test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
Copper Test Chamber: Particulate Manganese			
A	1.3	0.32	0
B	0.53	0.11	0
C	0	0	0
D	34	9.9	0
E	51	13	0
F	39	13	0
G	469	173	0
H1	3.2	1.3	0
H2	3.9	1.3	0
Copper Test Chamber: Dissolved Manganese			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	4.1	2.7	1.3
B	3.4	1.4	0
C	1.0	1.0	1.0
D	369	164	0
E	14	4.3	0
F	1.1	1.0	0.90
G	125	48	0
H1	2.5	1.2	0
H2	1.6	1.1	0.66
Lead Test Chamber: Particulate Manganese			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.71	0.22	0
B	1.4	0.24	0
C	0.89	0.23	0
D	21	6.8	0
E	43	11	0
F	34	12	0
G	478	173	0
H1	7.8	2.6	0
H2	3.6	1.4	0
Lead Test Chamber: Dissolved Manganese			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	4.3	2.8	1.4
B	3.3	1.4	0
C	1.0	1.0	1.0
D	360	160	0
E	18	5.7	0
F	1.2	1.0	0.86
G	130	46	0
H1	5.8	1.8	0
H2	1.7	1.1	0.61

Table 10.7
Comparison of nickel in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	<2.0	<2.0	<2.0
B	<2.0	<2.0	<2.0
C	<2.0	<2.0	<2.0
D	1.8	1.7	1.5
E	<2.0	<2.0	<2.0
F	1.6	1.5	1.3
G	4.0	2.5	0.9
H1	1.5	1.4	1.3
H2	12	3.0	0

Table 10.8
Comparison of zinc in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	<5.0	<5.0	<5.0
B	29	9.6	0
C	<5.0	<5.0	<5.0
D	5.6	5.2	4.7
E	32	12	0
F	17	8.0	0
G	38	15	0
H1	8.3	5.8	3.3
H2	12	6.9	2.0

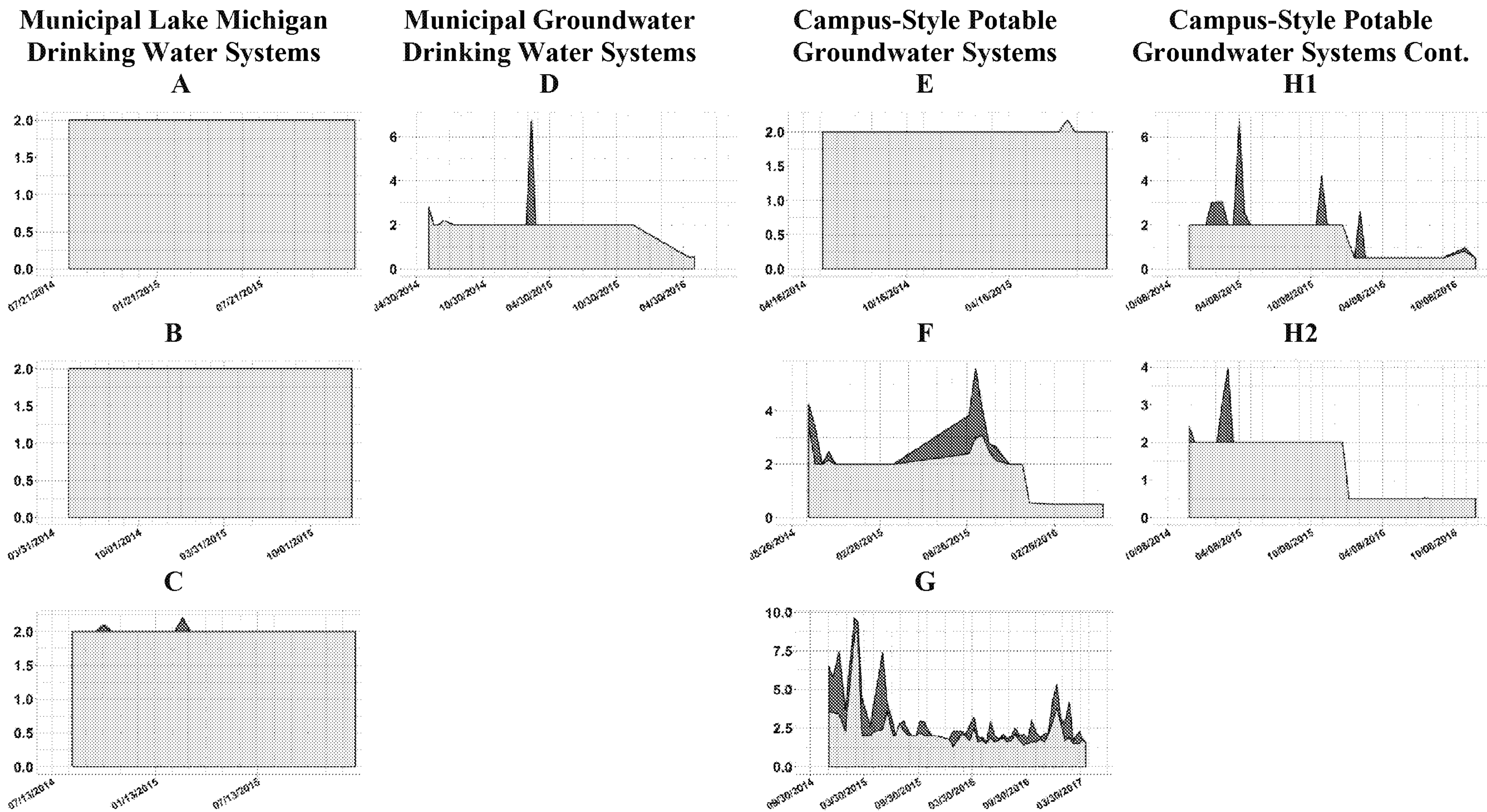


Figure 10.7 Nickel released into PRS monitoring station lead test chamber stagnating water in μg/L

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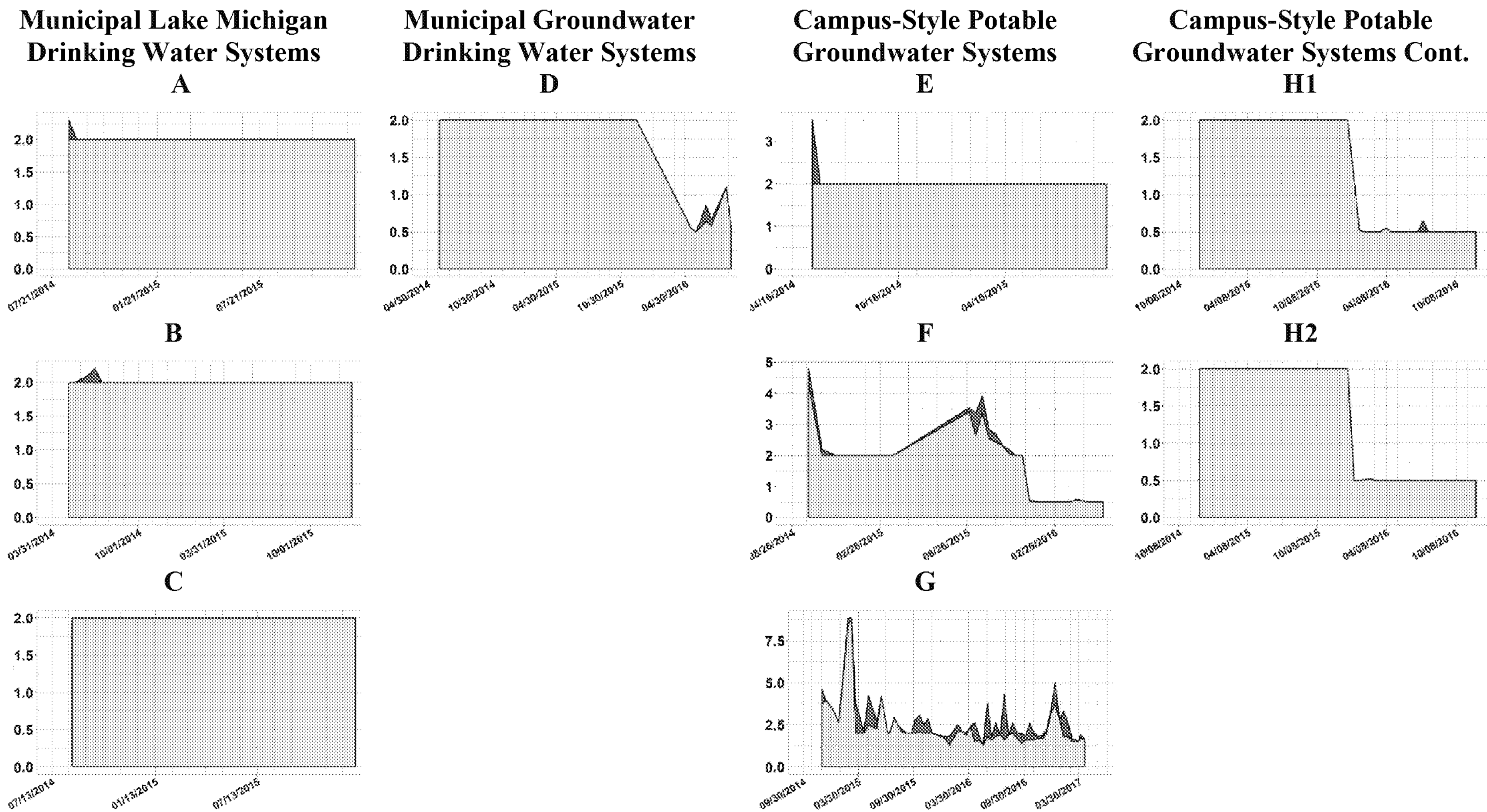

Figure 10.8 Nickel released into PRS monitoring station copper test chamber stagnating water in µg/L

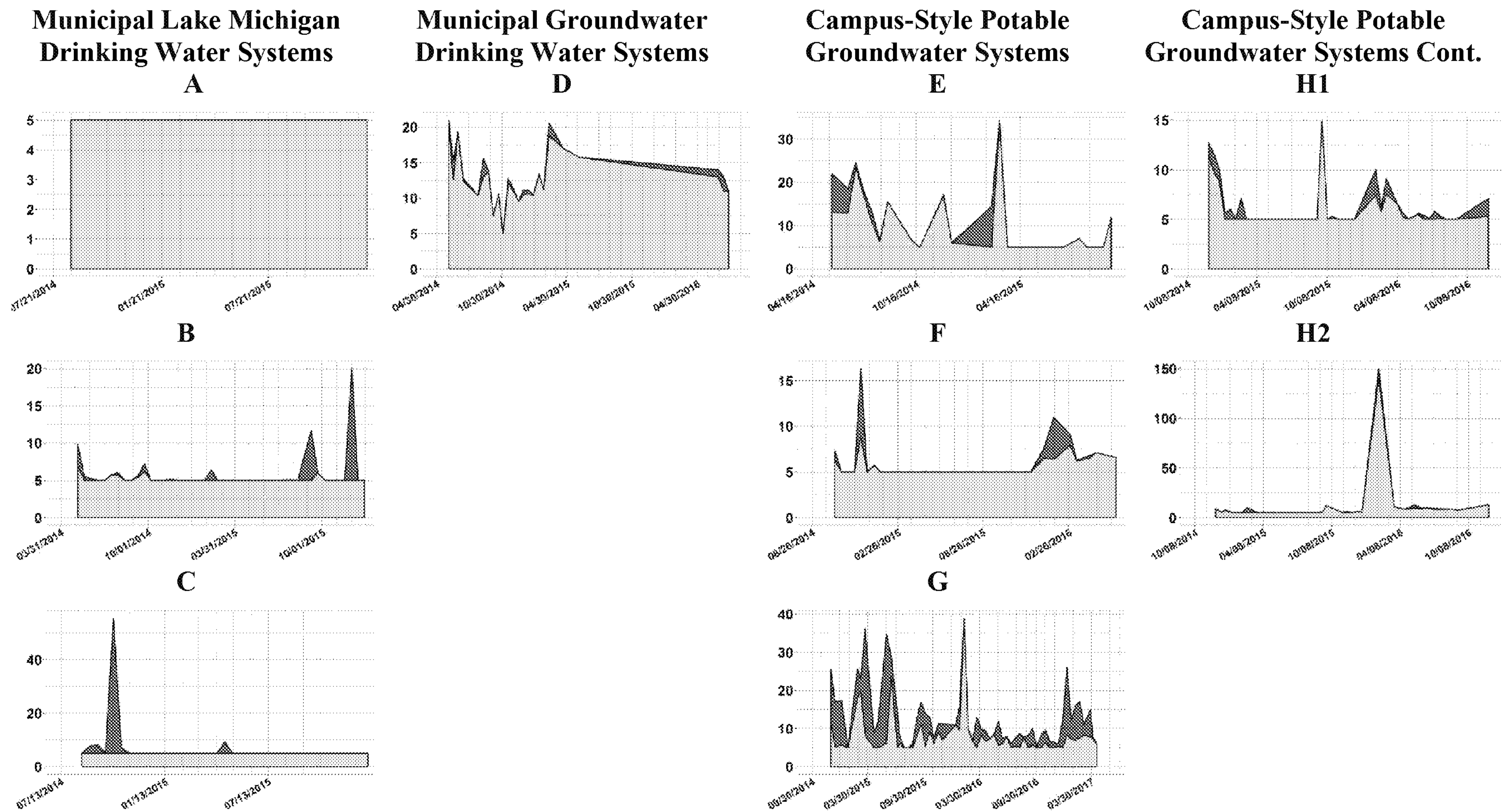

Figure 10.9 Zinc released into PRS monitoring station lead test chamber stagnating water in µg/L

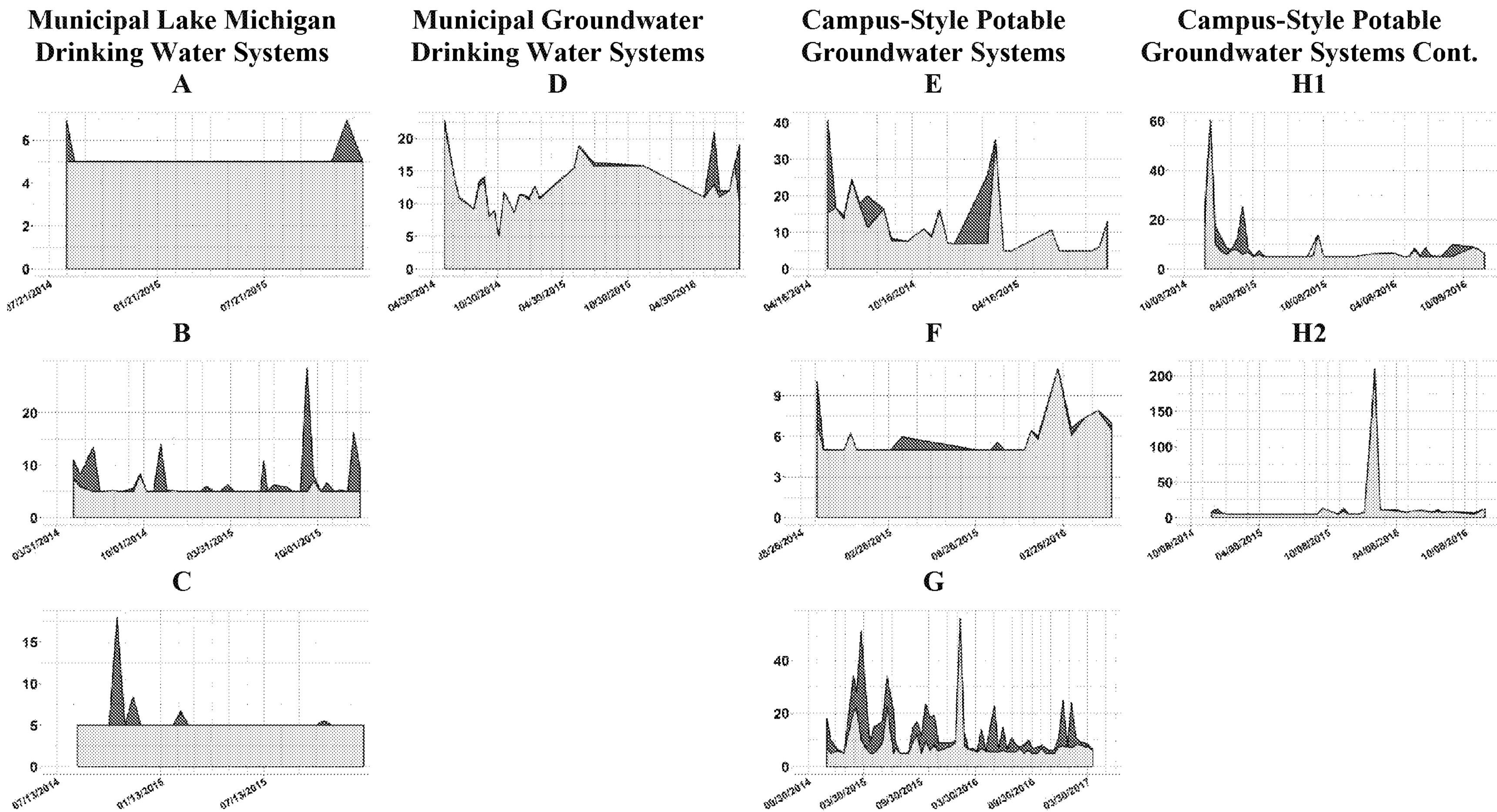

Figure 10.10 Zinc released into PRS monitoring station copper test chamber stagnating water in µg/L

Table 10.9
Nickel released into PRS monitoring station test chamber stagnating water in µg/L

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
Copper Test Chamber: Particulate Nickel			
A	0.03	0.01	0
B	0.03	0.01	0
C	0.00	0	0
D	0.02	0.01	0
E	0.16	0.04	0
F	0.31	0.10	0
G	2.2	0.44	0
H1	0.02	0	0
H2	0	0	0
Copper Test Chamber: Dissolved Nickel			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	2.0	2.0	2.0
B	2.0	2.0	2.0
C	2.0	2.0	2.0
D	1.9	1.8	1.6
E	2.0	2.0	2.0
F	2.4	1.8	1.1
G	4.0	2.4	0.76
H1	1.4	1.4	1.4
H2	1.5	1.4	1.3
Lead Test Chamber: Particulate Nickel			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0	0	0
B	0	0	0
C	0.05	0.01	0
D	0.96	0.15	0
E	0	0	0
F	1.0	0.27	0
G	2.7	0.80	0
H1	1.5	0.27	0
H2	0.36	0.08	0
Lead Test Chamber: Dissolved Nickel			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	2.0	2.0	2.0
B	2.0	2.0	2.0
C	2.0	2.0	2.0
D	2.2	1.9	1.7
E	2.0	2.0	2.0
F	2.2	1.7	1.2
G	3.9	2.3	0.76
H1	1.4	1.4	1.4
H2	1.6	1.5	1.4

Table 10.10
Zinc released into PRS monitoring station test chamber stagnating water in µg/L

Copper Test Chamber: Particulate Zinc			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.56	0.11	0
B	9.70	1.8	0
C	3.3	0.51	0
D	3.6	0.81	0
E	11	2.3	0
F	1.0	0.22	0
G	20	5.6	0
H1	8.4	1.6	0
H2	3.5	0.70	0
Copper Test Chamber: Dissolved Zinc			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	5.0	5.0	5.0
B	6.1	5.2	4.3
C	5.0	5.0	5.0
D	20	12	4.4
E	31	12	0
F	6.4	5.7	4.9
G	21	8.4	0
H1	19	7.7	0
H2	30	11	0
Lead Test Chamber: Particulate Zinc			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0	0	0
B	4.1	0.74	0
C	11	1.8	0
D	3.2	0.59	0
E	4.2	1.2	0
F	3.1	0.59	0
G	18	5.0	0
H1	1.5	0.41	0
H2	1.9	0.63	0
Lead Test Chamber: Dissolved Zinc			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	5.0	5.0	5.0
B	5.6	5.1	4.6
C	5.0	5.0	5.0
D	22	13	3.0
E	30	10	0
F	7.2	5.7	4.1
G	19	8.1	0
H1	8.3	5.8	3.3
H2	12	10	8.2

Table 10.11
Comparison of calcium in flowing system water in mg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	37	34	32
B	37	35	32
C	38	35	33
D	33	27	21
E	25	4.2	0
F	75	66	58
G	69	61	52
H1	92	82	72
H2	89	82	74

Table 10.12
Comparison of magnesium in flowing system water in mg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	13	12	11
B	13	12	11
C	13	12	11
D	8.4	5.7	3.1
E	24	4.2	0
F	41	36	32
G	33	29	26
H1	52	46	40
H2	51	46	41

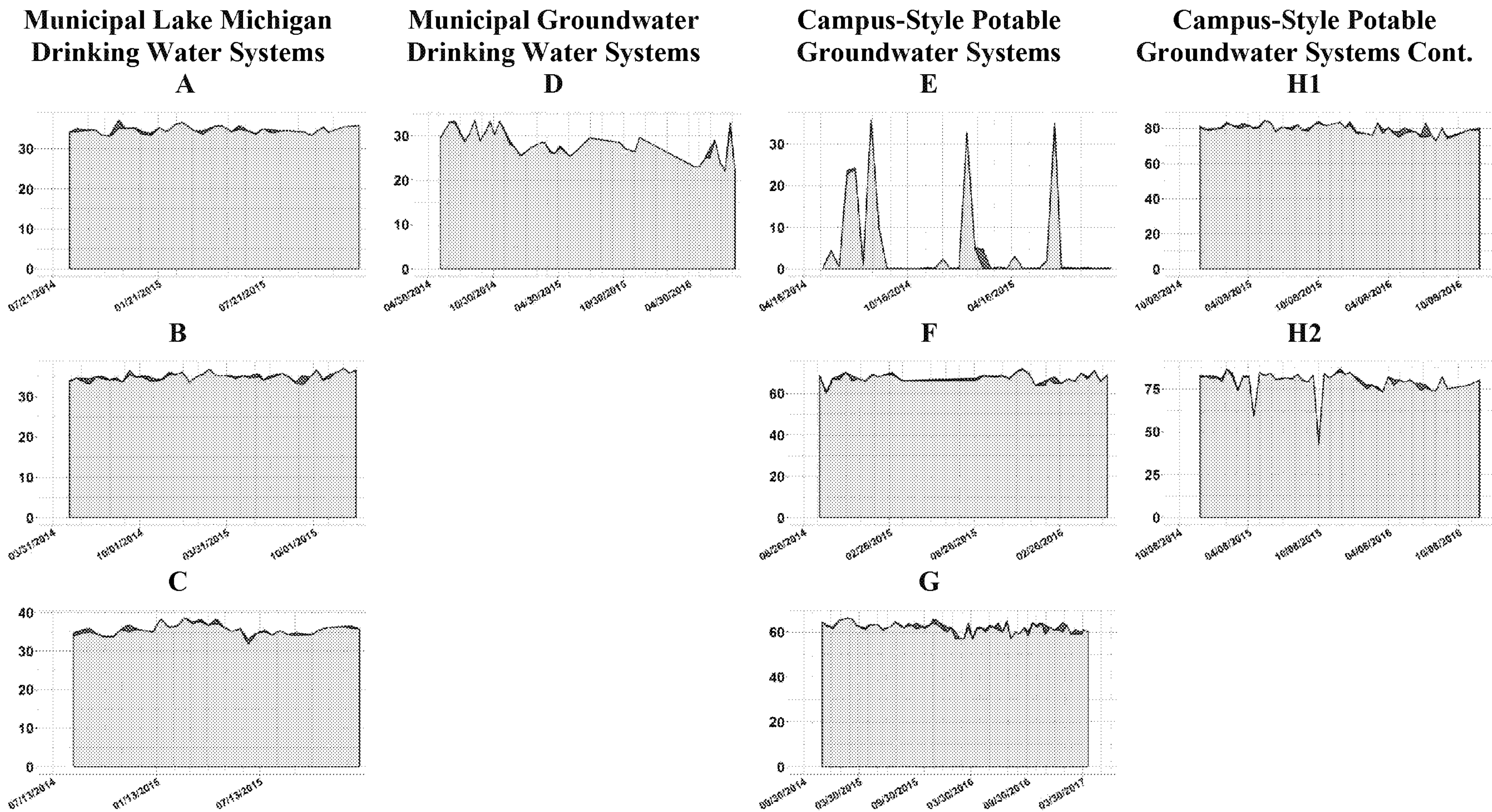

Figure 10.11 Calcium released into PRS monitoring station lead test chamber stagnating water in mg/L

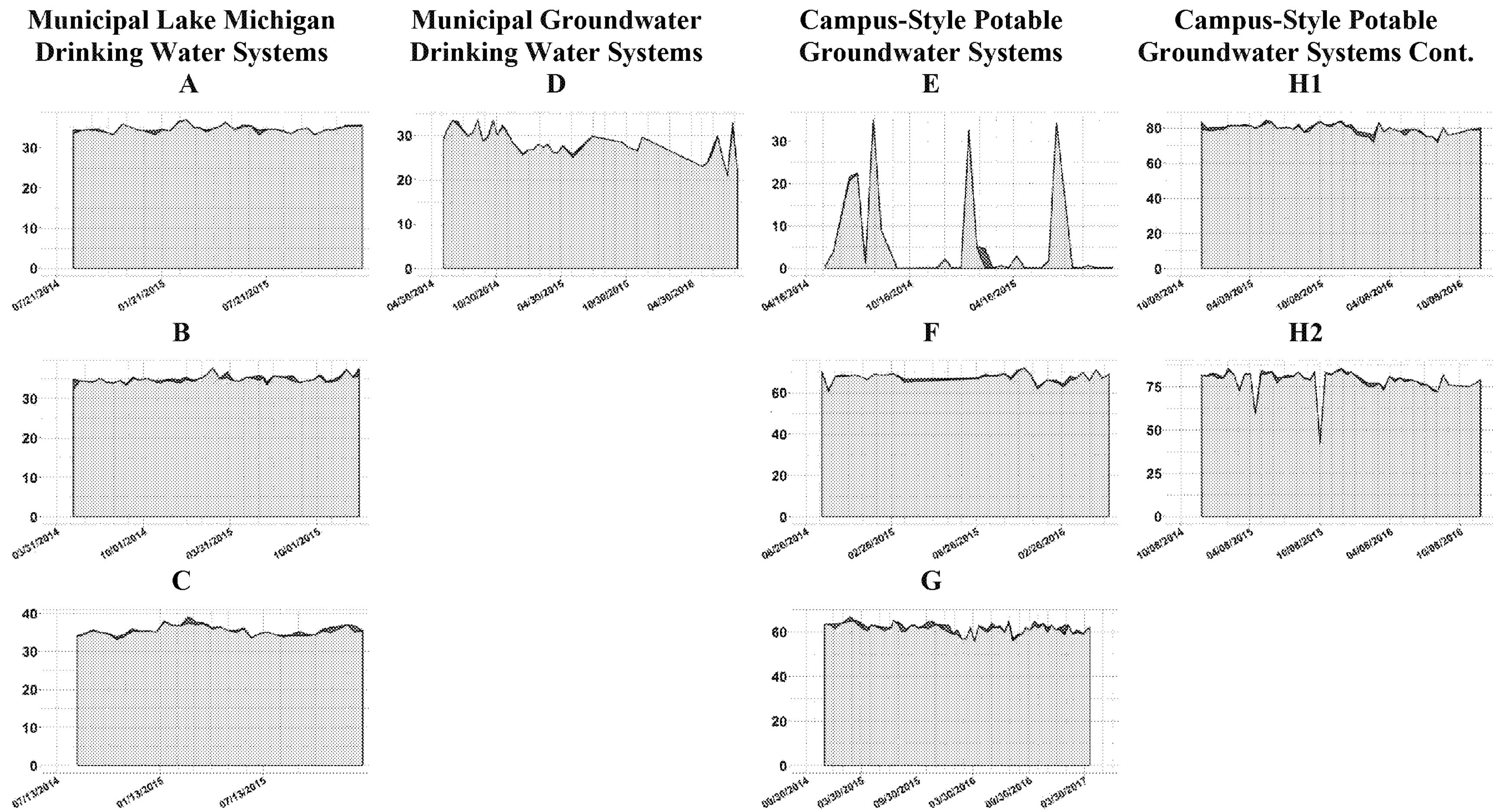

Figure 10.12 Calcium released into PRS monitoring station copper test chamber stagnating water in mg/L

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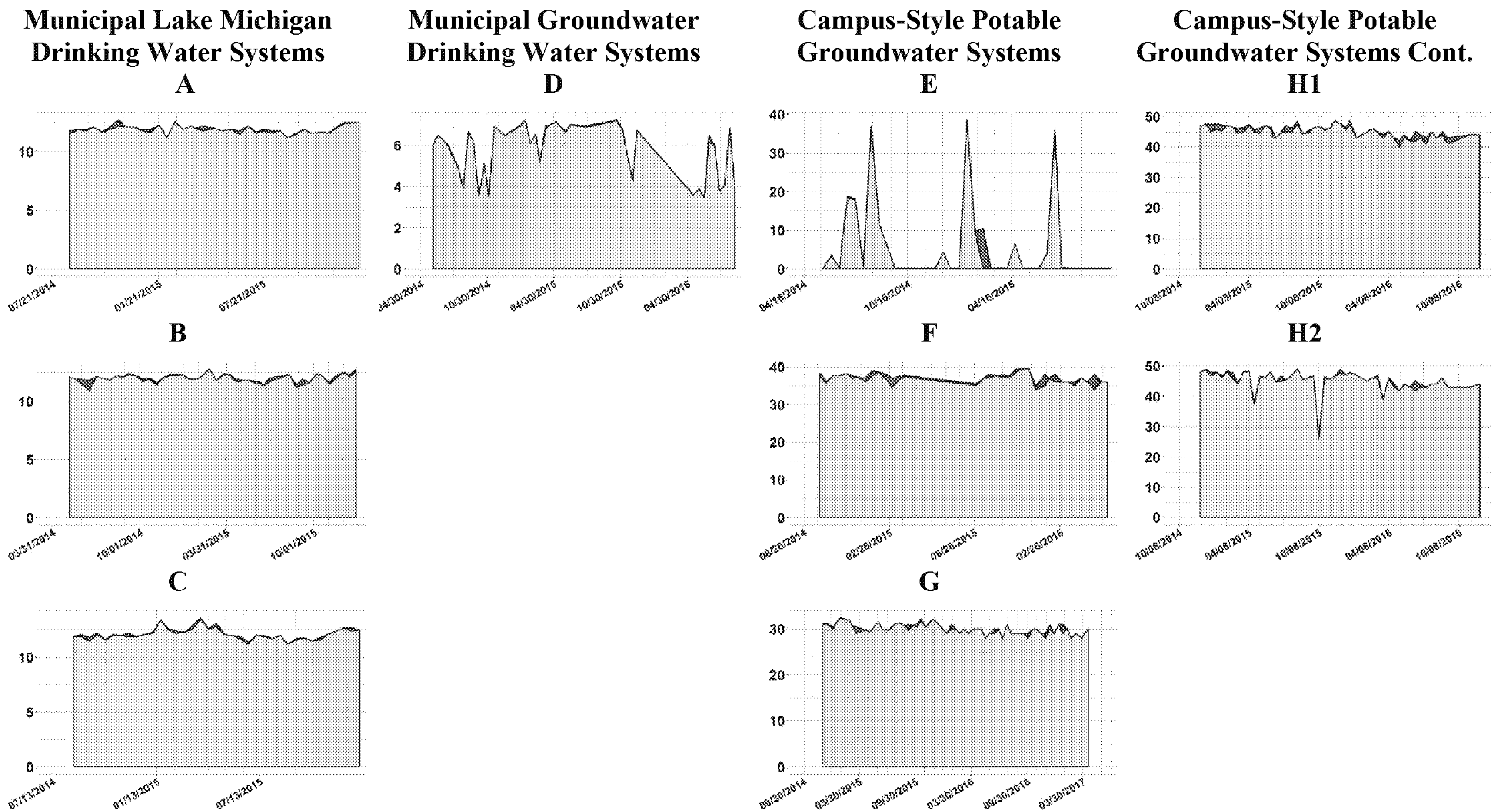


Figure 10.13 Magnesium released into PRS monitoring station lead test chamber stagnating water in mg/L

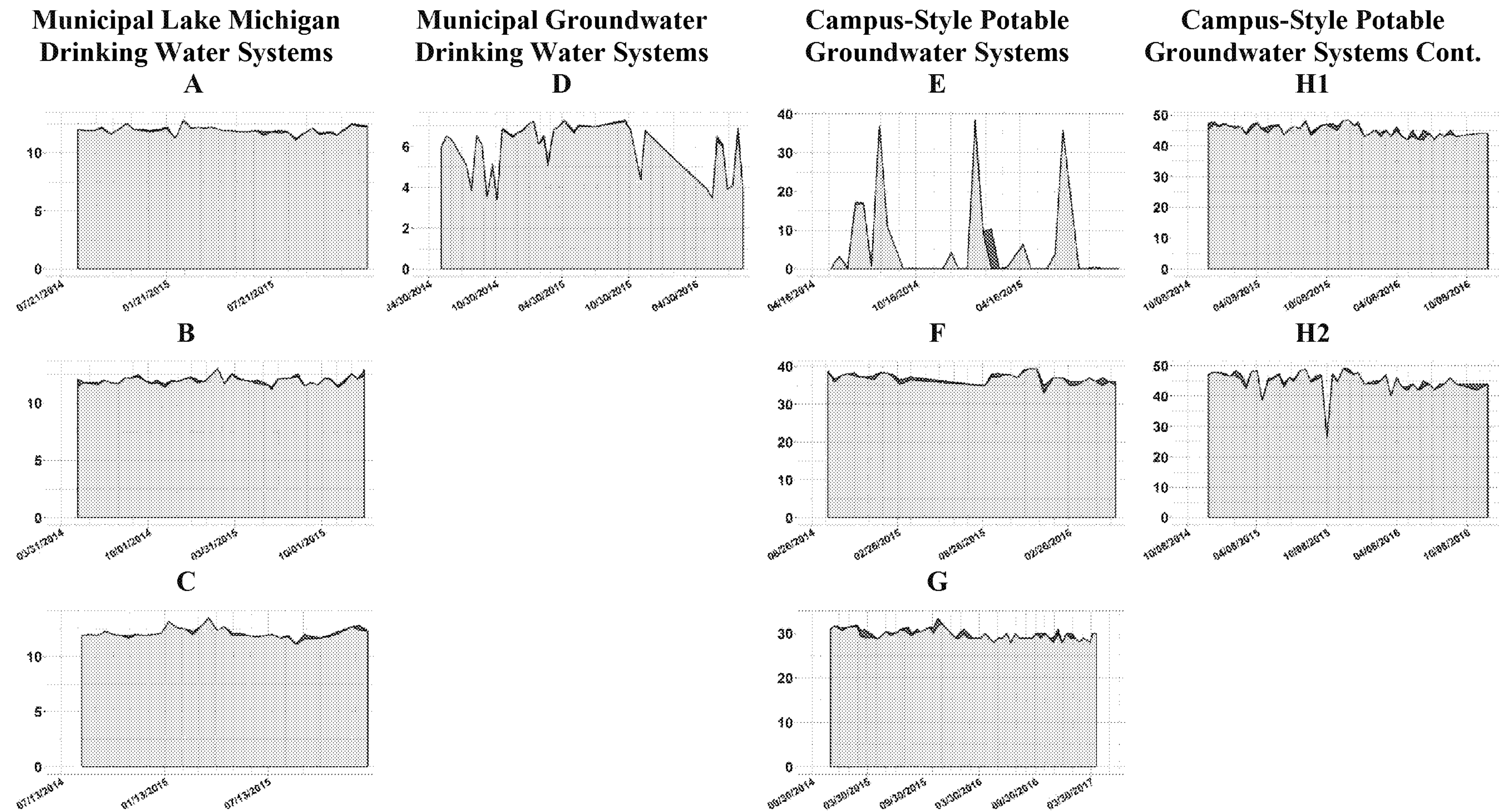


Figure 10.14 Magnesium released into PRS monitoring station copper test chamber stagnating water in mg/L

Table 10.13
Calcium released into PRS monitoring station test chamber stagnating water in mg/L

Copper Test Chamber: Particulate Calcium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.81	0.15	0
B	1.5	0.34	0
C	1.4	0.32	0
D	0.73	0.12	0
E	1.5	0.25	0
F	1.5	0.31	0
G	3.7	0.85	0
H1	2.8	0.71	0
H2	2.6	0.55	0
Copper Test Chamber: Dissolved Calcium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	37	35	32
B	37	35	32
C	37	35	33
D	35	28	21
E	27	5.8	0
F	74	67	61
G	67	61	56.
H1	84	7	74
H2	92	78	64
Lead Test Chamber: Particulate Calcium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	1.2	0.20	0
B	1.5	0.30	0
C	1.4	0.29	0
D	0.80	0.13	0
E	1.2	0.23	0
F	2.5	0.46	0
G	3.3	0.65	0
H1	3.5	0.73	0
H2	2.7	0.49	0
Lead Test Chamber: Dissolved Calcium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	37	35	32
B	37	35	32
C	38	35	33
D	35	28	21
E	25	4.9	0
F	74	67	61
G	67	61	56
H1	85	79	74
H2	93	79	64

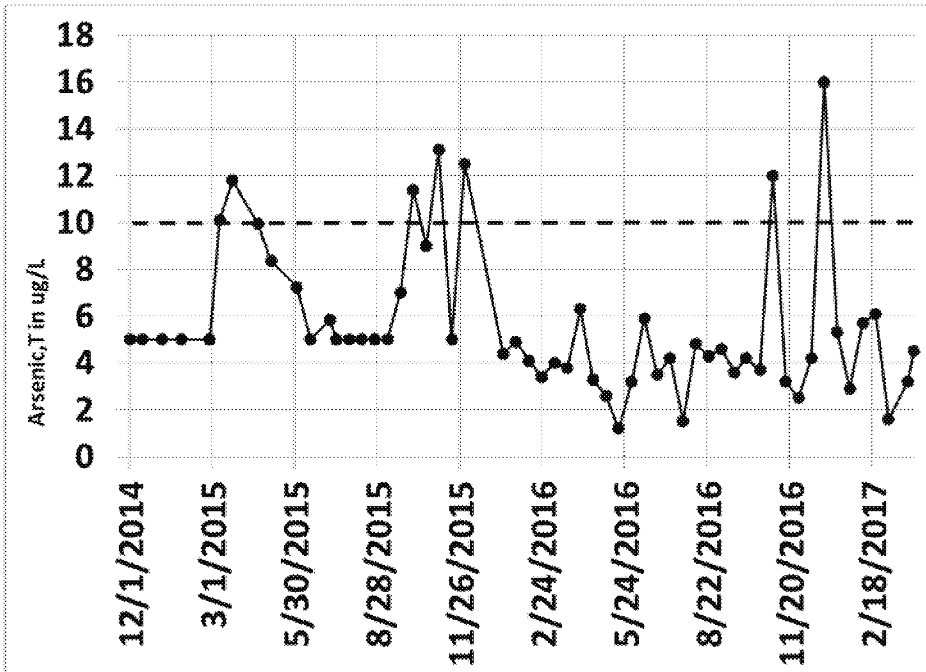
Table 10.14
Magnesium released into PRS monitoring station test chamber stagnating water in mg/L

Copper Test Chamber: Particulate Magnesium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.19	0.04	0
B	0.41	0.09	0
C	0.34	0.06	0
D	0.16	0.03	0
E	2.7	0.39	0
F	2.1	0.42	0
G	1.3	0.33	0
H1	2.3	0.46	0
H2	2.0	0.40	0
Copper Test Chamber: Dissolved Magnesium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	13	12	11
B	13	12	11
C	13	12	11
D	8.8	5.8	2.9
E	28	5.8	0
F	40	37	34
G	32	30	28
H1	49	45	41
H2	53	45	37
Lead Test Chamber: Particulate Magnesium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	0.40	0.08	0
B	0.47	0.09	0
C	0.47	0.09	0
D	0.14	0.03	0
E	2.4	0.39	0
F	3.3	0.67	0
G	1.0	0.19	0
H1	3.0	0.67	0
H2	1.9	0.31	0
Lead Test Chamber: Dissolved Magnesium			
Water System	**Highest Expected Concentration**	**Average Concentration**	**Lowest Expected Concentration**
A	13	12	11
B	13	12	11
C	13	12	11
D	8.8	5.8	2.7
E	28	5.4	0
F	40	37	33
G	33	30	27
H1	49	45	40
H2	52	45	37

Table 10.15
Total arsenic concentrations in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
A	6.0	5.2	4.3
B	5.8	5.1	4.5
C	5.1	5.0	4.9
D	4.3	4.0	3.6
E	5.7	5.2	4.6
F	9.5	5.0	0.4
G	12	5.8	0
H1	4.6	3.3	2.1
H2	4.2	3.3	2.4

Arsenic concentration at a high water age location was measured over the source water maximum contaminant goal of 10 µg/L in about 10% of the system water samples (6 out of 56 samples). See Figure 10.15. The source water was in compliance with the maximum contaminant goal, but out in the distribution system, particulate arsenic released from scale above that limit.



The dashed line is the Maximum Contaminant Limit for arsenic in source water (10 µg/L).

Figure 10.15 Water System G: Arsenic released in flowing system water in µg/L taken at a high water age location (PRS monitoring station influent tap)

Table 10.16 lists the statistics for arsenic release into the stagnating water of the lead and copper test chambers. This shows that the release of arsenic in the distribution system tends to be in particulate form.

Table 10.16
Water System G: Arsenic released into PRS monitoring station test chamber stagnating water in μg/L

Site	Highest Expected Concentration	Average Concentration	Lowest Expected Concentration
Copper Test Chamber Particulate Arsenic	22	7.5	0
Copper Test Chamber Dissolved Arsenic	4.5	3.3	2.0
Lead Test Chamber Particulate Arsenic	21	7.7	0
Lead Test Chamber Dissolved Arsenic	3.8	3.3	2.7

TURBIDITY

System Water

Turbidity, representing particulates in the water, at the high water age locations in the systems are shown in Table 10.17. Water System D had the highest average system water turbidity.

Table 10.17
Turbidity in flowing system water in NTUs taken at a high water age location (PRS monitoring station influent tap)

Water System	Highest Expected	Average	Lowest Expected
A	1.0	0.7	0.30
B	0.6	0.2	0
C	0.3	0.1	0
D	8.3	2.9	0
E	1.4	0.6	0
F	1.2	0.6	0
G	1.7	0.9	0.10
H1	0.9	0.4	0
H2	1.0	0.4	0

Building Plumbing

For the four campus water systems where all buildings were accessible for monitoring, turbidity of the water was measured weekly at various locations as explained in Chapter 5. These were all water systems where microbiologically influenced corrosion had been found in the wells along with corroding metal components of the well. This appeared to have inoculated the rest of the plumbing system with the result that water mains and premise plumbing had significant quantities of pipe wall accumulations of chemical scales and biofilms. The measurement of turbidity tracked the release of these materials in the water systems' buildings.

In addition, efforts were made to break up and flush out the accumulations and clean up the water systems. Because of the quantity of accumulations, this had to be done slowly so as to not release material too fast and create a temporary water quality issue. The measurement of turbidity tracked the release of the material over time in order to alert water system personnel to any periods of high pipe wall debris release. Biofilm removing chemical dosage and flushing efforts were managed based on weekly building turbidity results.

The general turbidity patterns at each site were also studied. To compare turbidity between sites and systems, the Shewhart statistics were used. A summary table (Table 10.18) shows that hot water systems had the highest turbidities. This confirmed the findings of the initial investigations of each of these campuses where the highest microbiological populations and metals concentrations were measured in the hot water systems of these buildings. In addition, water from softeners in buildings was found to have high microbiological populations in the initial investigations. Softeners provide an environment of high water residence time and high resin surface area conducive to excessive microbiological growth.

Table 10.18
Summary table –average turbidity for each type of piping system in buildings in NTU

System	Water Entering Building	Far Cold Water Tap	Softener Outlet	Far Hot Water Tap
E	0.70	0.51	0.60	1.4
F	0.75	0.67	0.59	1.1
G	0.88	1.5	0.93	1.6
H	1.7 (actually deeper inside building than other "entry points")	0.62	no data	0.58

METAL PLATE CHEMICAL ANALYSIS

Many aspects of the metal plate scale analysis have already been discussed. The discussion is completed here with a look at aluminum, iron, and manganese in the scales (Tables 10.19 and 10.20).

Aluminum on lead plates was the highest in the scales of the three Lake Michigan water systems, Systems A, B, and C where aluminum-based coagulants are used. Water System A uses alum and displayed highly pronounced aluminum concentration pattern in the water and a high presence of aluminum in the lead plate scales. Water System B uses a polyaluminum hydroxychloride as a coagulant. There is no significant aluminum concentration in the water except for isolated peaks that may come from the lake or the coagulant but a significant presence on the lead plate scales. Water System C presents a third variation. Alum is used as in Water System A and there is a similar pronounced pattern of aluminum concentration. Yet, there is little presence of aluminum in the lead plate scales. Aluminum can also be found in the copper plate scales (Table 10.20) at the same or in lower amounts for the three systems. The groundwater systems do not have aluminum in their lead plate scales. Water Systems E and possibly F have some in their copper plate scales.

There is a very high presence of iron and manganese in Water System D lead and copper plate scales. The plates from Water System D were notable because they both were oddly colored, possibly from the presence of iron and manganese. In addition, phosphorus on both the lead and copper plates was "bound through adsorption onto amorphous iron oxide or hydroxide." These scales were unique.

Water System B would be expected to have lower iron and manganese because it is a lake water system. However, wells are used as a backup source of water. The wells are exercised routinely. The PRS Monitoring Station received some of this water especially during the issue of water stagnating in the influent line. Subsequently, iron and manganese built up on the lead plates. This is a reflection on the quality of the well water. In addition, Water System B had a harvested lead service line analyzed in 2013. The outer layer on the pipe was an iron/manganese hydroxide that could crumble and carry lead into the water.

Table 10.19
Extraneous elements on lead plates by x-ray fluorescence or energy dispersive spectroscopy by weight percent

Water System	Al	Fe	Mn
A	8.3	0.16	0.02
B	8.7	0.33	0.12
C	0.29	0	0.01
D-yellow area		0.80	0.15
D-blue area		1.8	0.39
D-hydrocerussite		1.4	0.28
D- Cerussite		1.9	0.18
D-Litharge		4.2	0.56
E			0.01
F		0.44	
G	PRS Monitoring Station still operating		
H		0.42	0.13

Table 10.20
Extraneous elements on copper plates by x-ray fluorescence or energy dispersive spectroscopy by weight percent

Water System	Al	Fe	Mn
A	5.2	0	0.01
B	0.23	0	0
C	0.47	0	0
D-lower P area		2.4	0.21
D-higher P area		12	0.37
E	0.35	<LOD	0.01
F	<LOD	0.66	
G	PRS Monitoring Station still operating		
H		0.38	0.22

LOD=Limit of Detection

CORRELATIONS

The following common trends were found between water quality parameters and the release of lead and copper in the test chambers:

Water System A showed a trend of influent turbidity with the release of particulate lead in the lead test chamber. Particulate iron was also measured in both test chambers and in the influent system water when influent turbidity was high. The turbidity was high in the system water when aluminum in the system water was low; this would correspond with the use of alum as a coagulant when the source water was the most turbid; this translates into the distribution system.

In Water System B, high turbidity in the system water corresponded with high microbiological population in the system water. Particulate iron, manganese, and aluminum release trended with particulate lead and copper release.

In Water System C, release of particulate iron, manganese, and aluminum trended together with particulate lead and copper.

For Water System D, metals concentrations were high in the system water and in the stagnating test chamber water. A variety of particulate metals tended to be measured releasing at the same time; likewise, a variety of dissolved metals tended to be measured releasing at the same time. When water system turbidity was high, high particulate metals were found in the test chambers; dissolved metals were found to be lower when particulate metals were higher. High turbidity occurred when microbiological populations were low.

In Water System E, particulate manganese trended with particulate lead and copper.

In Water System F, particulate lead was released in the lead test chamber at the same time as many other particulate metals.

Dissolved copper was released in the copper test chamber when dissolved barium, potassium, and sodium were high. This may imply that a certain well had these characteristics and dissolved copper released when that well's water was filling the water system.

With Water Systems G and H, release of particulate lead and copper trended with release of particulate iron and manganese and other metals. Release of dissolved lead and copper trended with the release of other dissolved metals as was seen in Water System D.

As shown in Appendix A, all water systems had particulate lead and copper trending with particulate iron, manganese, and/or aluminum in the water.

SUMMARY

A number of metals were studied in the water systems besides lead and copper. It was found that a variety of particulate metals tended to release together; a variety of dissolved metals tended to release together at other times. It could not be determined in this study if particulate iron, manganese, and aluminum, for example, caused the release of particulate lead and copper or if they were all merely co-trending parameters.

Various metals were intertwined in the scales on the metal surfaces. This implies that one cannot assume scale protective against corrosion will be deposited on clean metal surfaces. Instead, it can be assumed that such scales will be deposited on and within complex pipe wall accumulations.

In the correlation study, turbidity was sometimes representative of particulate metals in the water, sometimes representative of microorganisms in the water, and sometimes not correlative to other water quality parameters at all. Turbidity cannot be claimed to definitively represent particulate lead, particulate copper, or microbiological population. Perhaps the common light scattering analysis of turbidity is not sensitive enough to make these correlations. The precision of the turbidity analyses used in this project ranged from +/- 0.02 to 0.53 NTUs (See Table 5.8). Investigation of newer turbidity technology techniques, such as laser techniques, as a more sensitive water quality indicator should be performed.

However, if turbidity is high, it is by definition a measure of particulate matter in the water. The particulate matter can either come from water source particulates or pipe wall accumulations and it is undesirable to have this debris in the water. It is reasonable to assume that there is higher potential for water quality issues to be occurring, including the release of lead and copper to the water, with higher turbidity.

CHAPTER 11
OPERATIONS, MAINTENANCE, AND CLEANING OF WATER SYSTEMS AND THEIR INFLUENCE ON METAL RELEASE

The water systems participating in this project went through varying degrees of cleaning and phosphate dosing. The outcome of monitoring these activities have been scattered throughout Chapters 6 to 10. In this chapter, the story for each system's lead and copper release is continued with a focus on the effect of cleaning efforts and other system events.

Each water system story began in Chapter 2 and was continued in Chapter 6. In this chapter, significant system events are summarized and the details of the dissolved and particulate lead and copper release trends are shown in a graph relating to cleaning efforts. Then, Lead and Copper Rule data before and after cleaning are shown in box and whisker plots (see Chapter 5). Note: All lead and copper concentration units on box and whisker plots are in μg/L. Refer to Tables 11.18 and 11.19 for a summary of Lead and Copper Rule maximum concentrations, 90th percentile concentrations, and cleaning activities for all water systems. Refer to Table 11.20 for a summary of all cleaning outcomes on lead and copper release in each water system.

CLEANING EFFORTS BY WATER SYSTEMS

Water System K

Water System K exceeded the lead Action Level in 2005. In a subsequent investigation, particulate lead and particulate manganese were found co-trending in residential water samples. Microbiological factors and chloride concentration were identified as factors regarding copper release. Manganese control and uni-directional flushing of water mains were recommended to remove legacy chemical scales and biofilms and to keep new accumulations from forming. Uni-directional flushing was first performed in the system in 2007. In 2008, the Lead and Copper Rule data showed a lower 90th percentile lead release below the Action Level. By 2016, the 90th percentile was 5.5 μg/L. See Figure 11.1. This research project was inspired by the Water System K success.

2007 Uni-directional flushing of water mains begins	Uni-directional flushing of water mains performed most summers

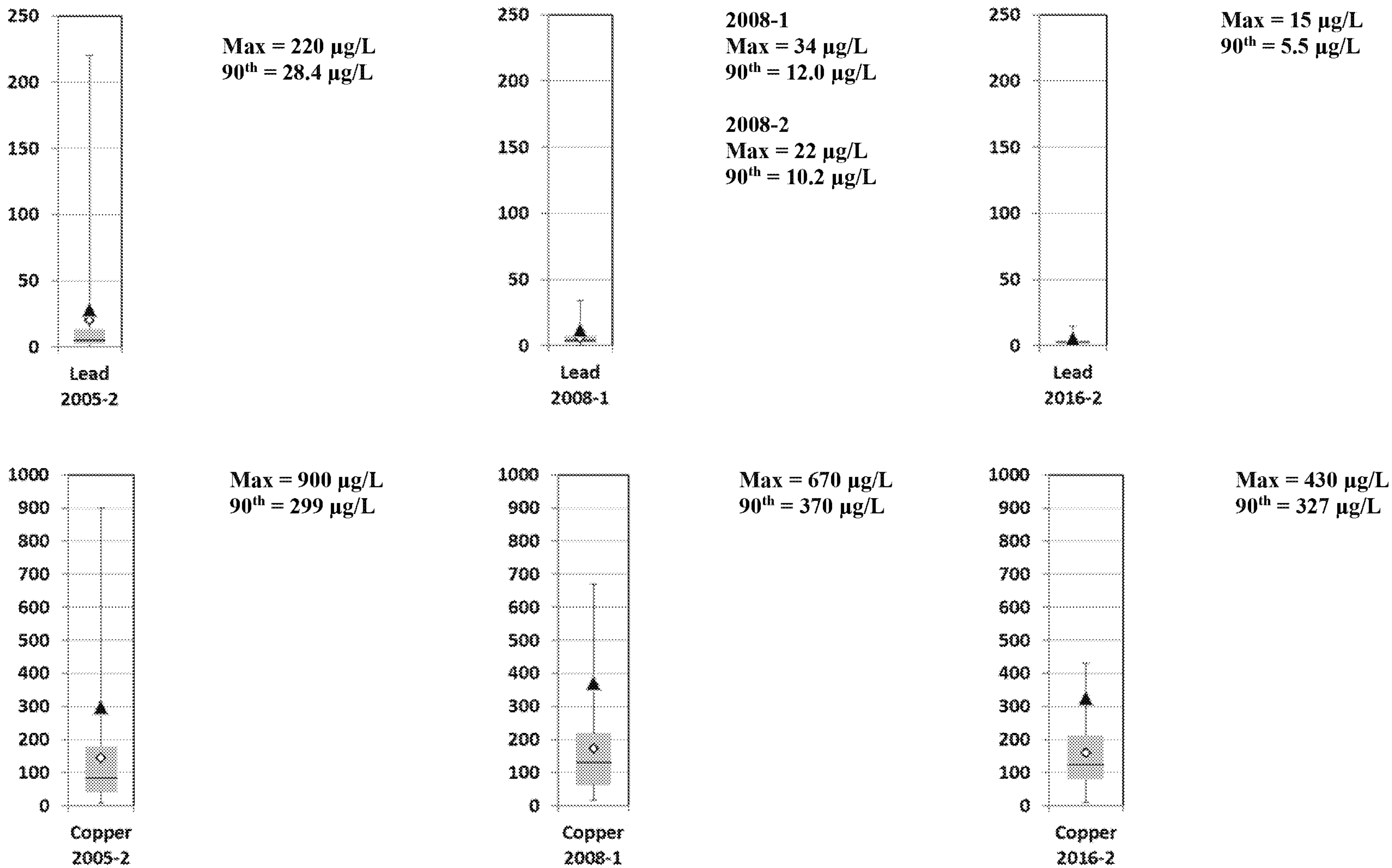


Figure 11.1 Water System K: Lead and Copper Rule data box and whisker plots

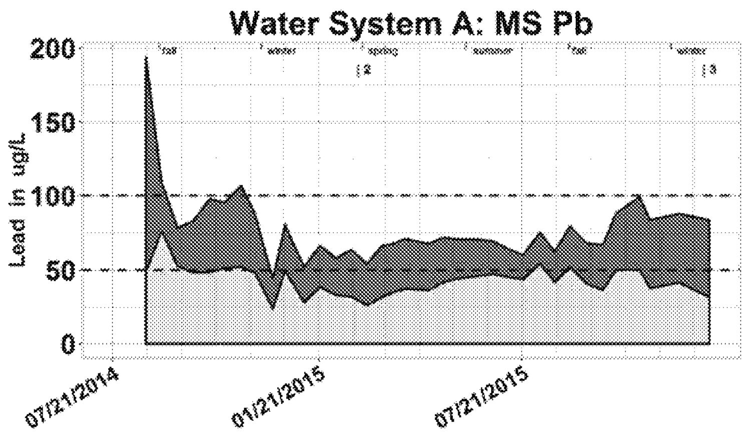
Water System A

Table 11.1
Water System A: Historical timeline significant to existing water quality

Date Range	Event
Before 2008	Had been adding 50/50 poly/orthophosphate blend for corrosion control
4/2008 - 9/2008	Offline chemical comparison study of phosphate products using PRS Monitoring Station
4/2008 - 9/2008	PRS Monitoring Station distribution system study of original water system where free chlorine disinfection and 50/50 poly/orthophosphate chemical were used
9/2008 - 11/2008	PRS Monitoring Station distribution system study of change to 10/90 poly/orthophosphate while still using free chlorine (see previous offline tests)
11/2008- 4/2009	PRS Monitoring Station distribution system study of change to chloramine disinfection
11/2009	PRS Monitoring Station study distribution system of steady states of water system after big changes and use for process control

Table 11.2
Water System A: Monitoring project timeline

ID	Date	Event
1	July 17, 2014	Started new PRS Monitoring Station project
2	March 02, 2015	Began feeding less alum for the year
3	January 04, 2016	Shutdown PRS Monitoring Station



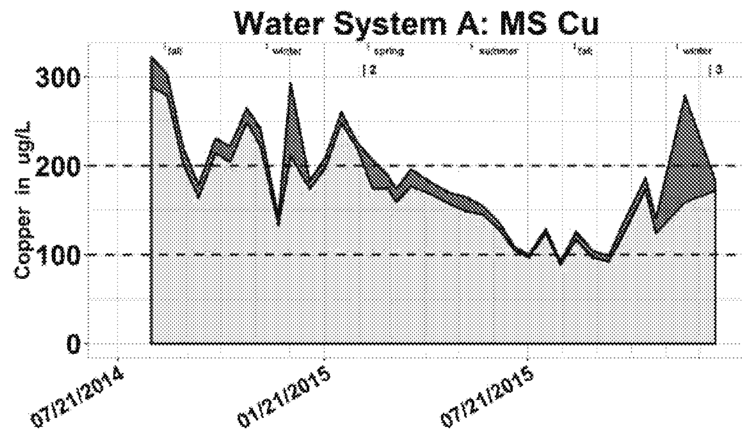


Figure 11.2 Water System A: Lead and copper release in PRS monitoring station test chambers

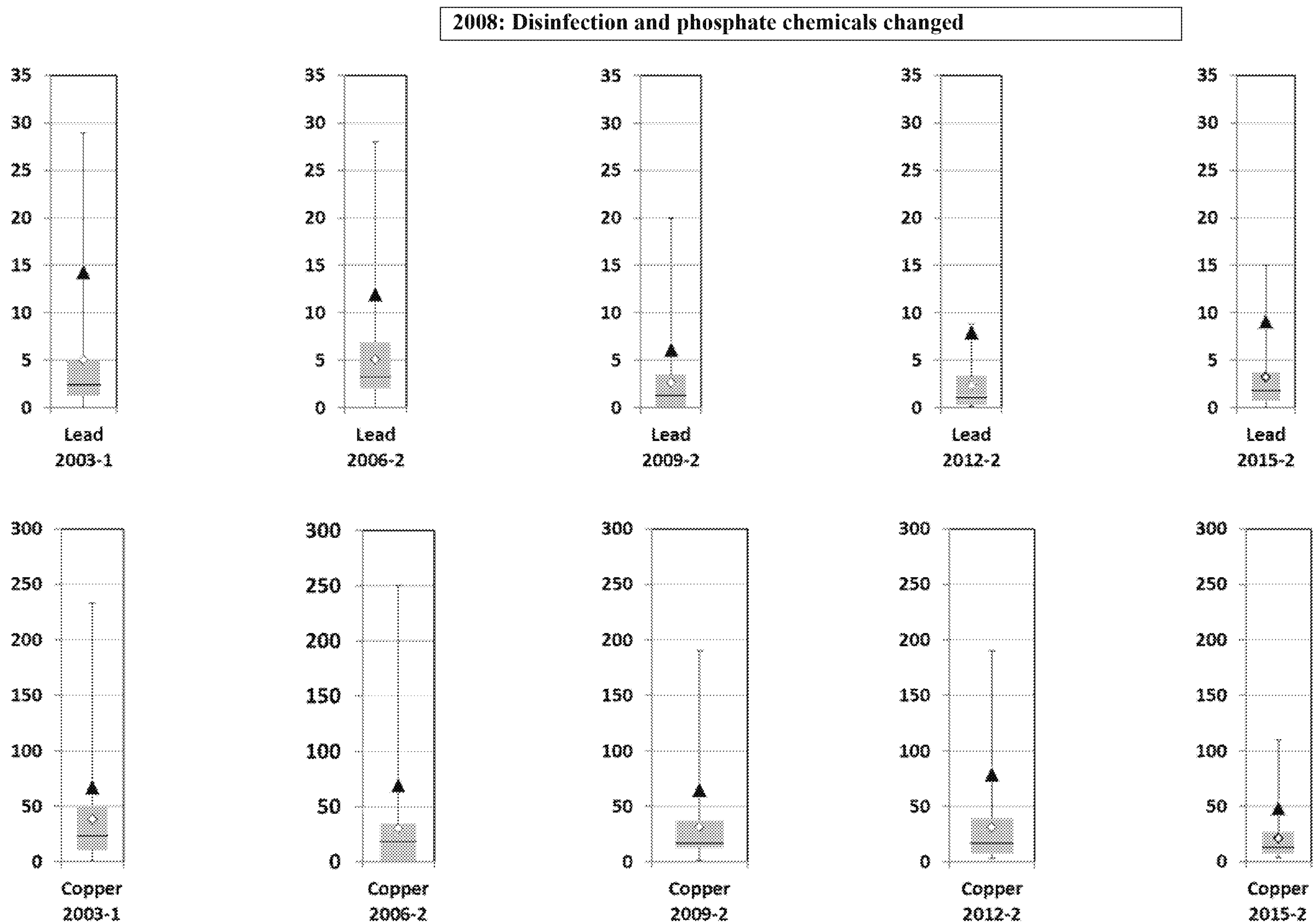


Figure 11.3 Water System A: Lead and Copper Rule data box and whisker plots

Water System A timelines of system changes and of monitoring project events are shown in Tables 11.1 and 11.2. Lead and copper release data are shown in Figures 11.2 and 11.3.

There were no significant cleaning events for Water System A during this project. The monitoring station data reflected the status quo of water quality since the 2008 disinfection and phosphate changes. The PRS Monitoring Station data showed particulate lead as a significant fraction of the total lead released in the water system. Nitrification patterns of lead and copper release were observed. Lead and Copper Rule data show a possible slow increase of the lead maximum and 90th percentile concentrations over time.

It is recommended that this water system consider the following actions to improve upon lead and copper control in the water systems:

- Plan for the removal of complete lead service lines.
- Make water main high velocity cleaning a priority. Without the pipe wall build-up of aluminum, iron, and manganese, the cyclic influences on lead and copper release become less severe. Clean water mains send less debris into building plumbing. With less accumulation in plumbing, it is possible that lead concentrations can be lowered by 50% by removing this material.
- Plan for the replacement of older and corroded water main to remove particulate iron from the water system.
- Consider optimization of alum use so that there is less excess build-up in the distribution system.
- Consider studying measures to lessen the degree of nitrification, such as boosting the total chlorine dosage and chlorine to ammonia ratio.
- Consider optimizing phosphate dosage as the current dosage has been found to be more than adequate to create a high presence of pyromorphite on pipe walls as shown in the lead plate scale analysis. Phosphate should only be adjusted incrementally and in tandem with the use of the distribution system monitoring station for feedback.

Water System B

Table 11.3
Water System B: Historical timeline significant to existing water quality

Date Range	Event
2000	Ozone on-line; begin to have trouble with copper pressure reducing valve components; now all are replaced with stainless steel
2005	2nd transmission line from lake to plant was built and in operation by June; treatment plant capacity was increased; a sodium hypochlorite system was installed to replace the use of gaseous chlorine
2011	Variable frequency drives on pumps added; some water system repair and construction performed; Lead and Copper Rule lead exceedance
2012	Lead service line harvested and chemical scales studied; Distribution system investigation also initiated

Table 11.4
Water System B: Monitoring project timeline

ID	Date	Event
1	March 31, 2014	Startup of PRS Monitoring Station
2	June 01, 2014	First round of uni-directional flushing begins; flushing near PRS Monitoring Station in August 2014
3	January 12, 2015	Main break one block east of monitoring station
4	June 01, 2015	Second round of uni-directional flushing begins
5	January 04, 2016	Shutdown of PRS Monitoring Station

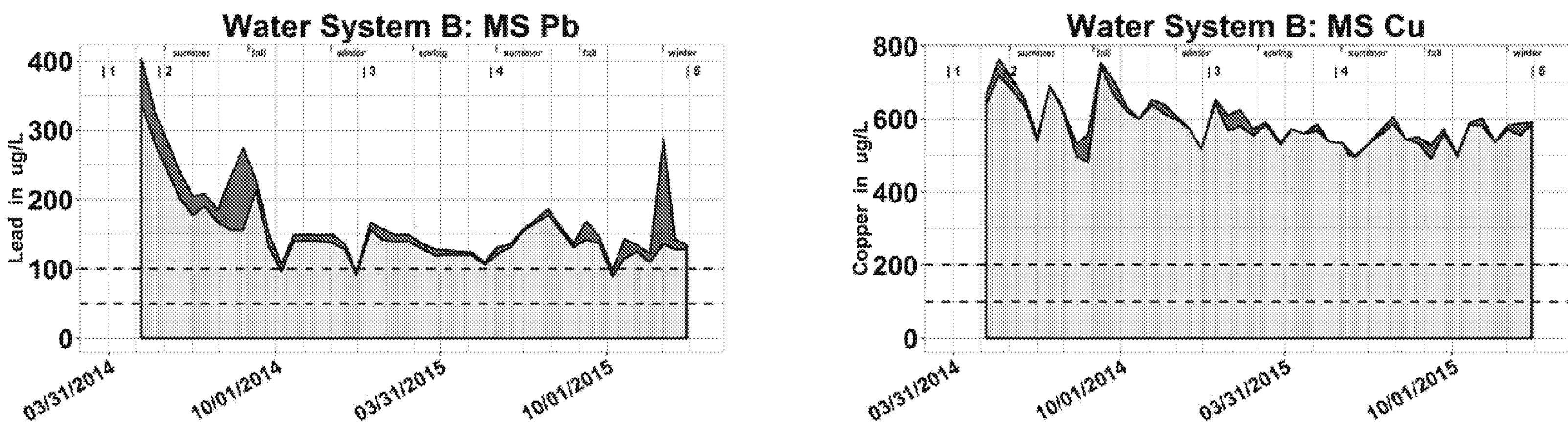


Figure 11.4 Water System B: Lead and copper release in PRS monitoring station test chambers

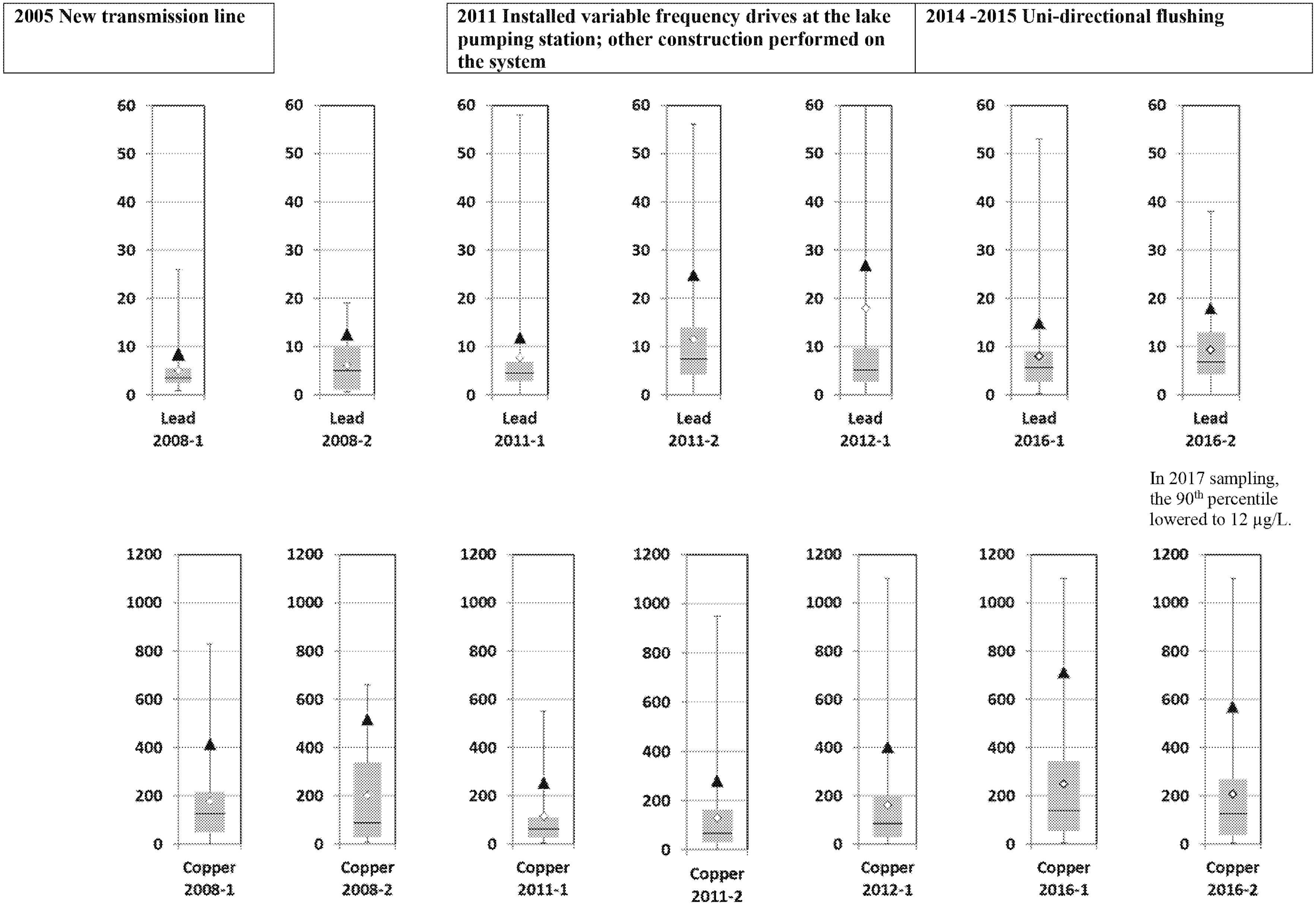


Figure 11.5 Water System B: Lead and Copper Rule data box and whisker plots

Water System B timelines of system changes and of monitoring project events are shown in Tables 11.3 and 11.4. Lead and copper release data are shown in Figures 11.4 and 11.5.

A relationship between legacy iron and manganese scales and particulate lead were identified with a study of harvested lead water service line scales. In addition, the PRS Monitoring Station data showed a relationship between particulate lead and aluminum scales.

Particulate and dissolved lead and copper release were also found to trend with microbiological factors of ammonia, dissolved organic carbon, and nitrate release – all related to nitrification cycles. An additional study by others traced the production of the three nutrients to biofilm formed in the lake water transmission lines, where residence time in the lines increased with the addition of the second transmission line in 2005. Two seasons of uni-directional flushing in 2014 and 2015 lowered the lead maximum and 90th percentile concentrations. However, flushing was not performed in the summer of 2016 and the 90th percentile lead concentration could not continue its decrease away from the Action Level. Instead, the 90th percentile lead concentration fluctuated just above the Action Level. With the completion of the biostability study as well as the monitoring station study, Water System B is on schedule to continue uni-directional flushing of water mains and in cleaning of the lake water transmission lines. After Lead and Copper Rule compliance sampling in 2017-1, Water System B was back in compliance with a 90th percentile lead concentration of 12 μg/L.

Stand-by wells also have the potential to become biologically unstable and to contribute particulate iron and manganese to the distribution system because of low usage.

Recommendations for this water system are:

- Plan for the removal of complete lead service lines and galvanized iron service lines.
- Continue to make water main high velocity cleaning a priority. Aluminum from coagulant and iron and manganese from intermittent use of groundwater that form the pipe wall debris must be routinely cleaned away. The scale is the precursor to transport of particulate lead and copper in premise plumbing. High velocity flushing also removes biofilms, the removal of which is essential to controlling a significant factor of lead and copper release in this water system.
- Plan for the replacement of older and corroded water main.
- Continue on the path to controlling the biostability of the transmission line water.
- Continue on the path to controlling the biostability of the water filter.
- Plan for investigation and routine maintenance of the stand-by wells for biostability.
- Consider incorporating the use of the wells in a more routine pumping/water blending program in order to achieve better biostability in the wells and to achieve more uniform chemical characteristics of system water.

Water System C

Table 11.5
Water System C: Historical timeline significant to existing water quality

Date Range	Event
1963	East Filter added
1999	Microfiltration system added
2011	Ran PRS Monitoring Station for the first time for year-long study

Table 11.6
Water System C: Monitoring project timeline

ID	Date	Event
1	July 13, 2014	Startup of PRS Monitoring Station
2	January 05, 2016	Shutdown of PRS Monitoring Station

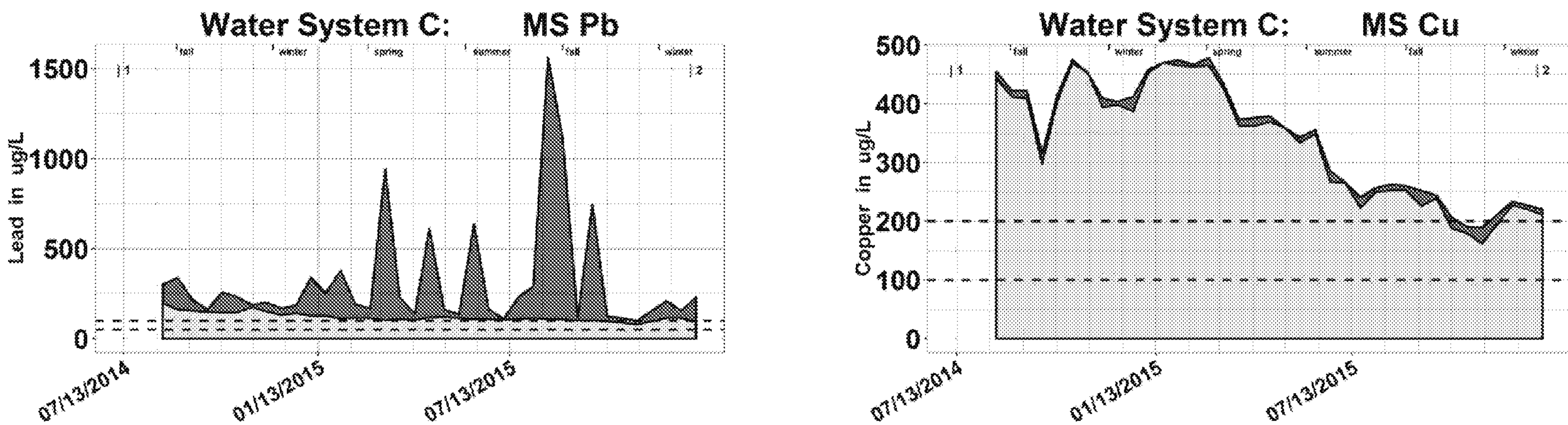


Figure 11.6 Water System C: Lead and copper release in PRS monitoring station test chambers

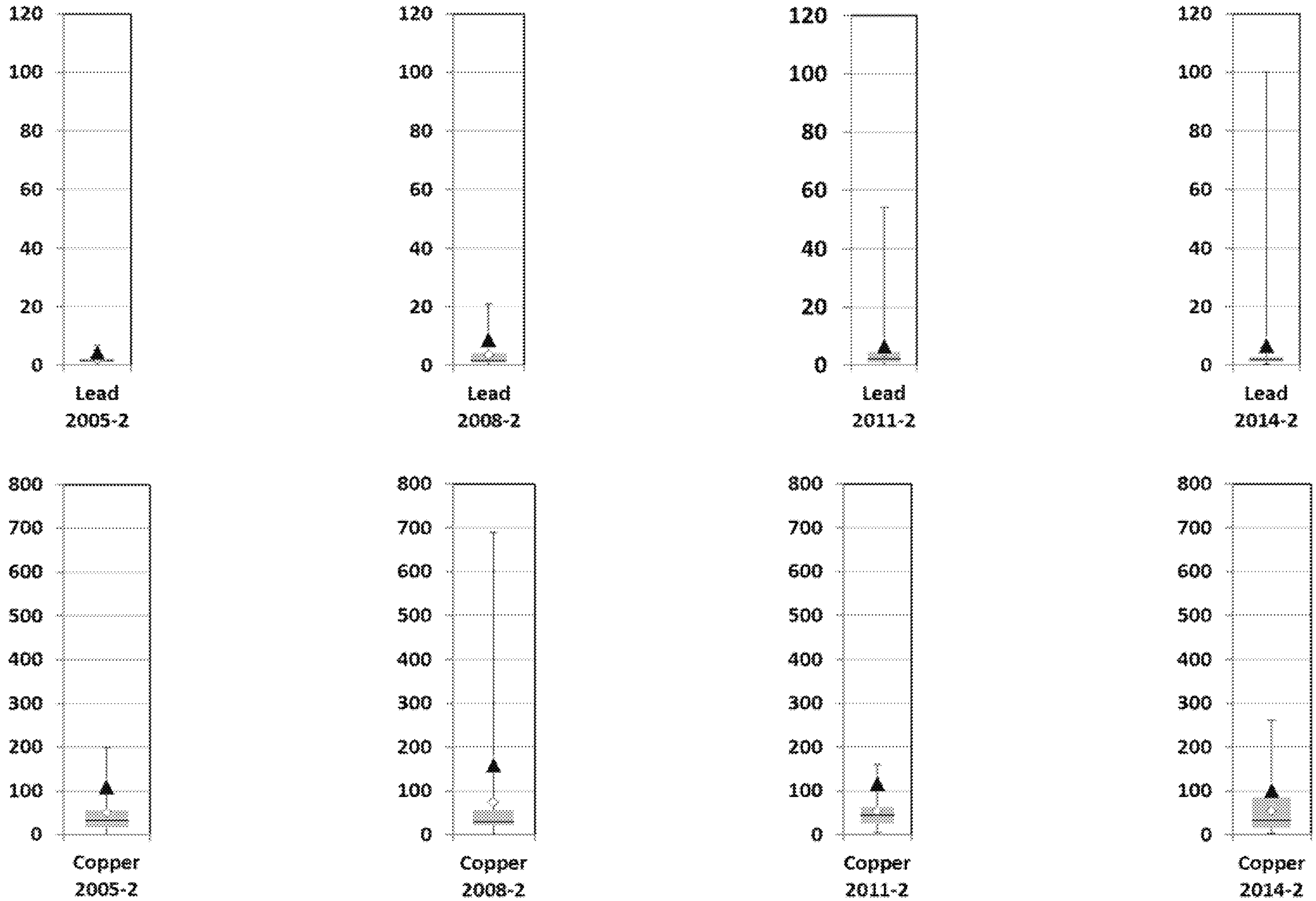


Figure 11.7 Water System C: Lead and Copper Rule data box and whisker plots

Water System C timelines of system changes and of monitoring project events are shown in Tables 11.5 and 11.6. Lead and copper release data are shown in Figures 11.6 and 11.7.

While Water System C has not been out of compliance with the Lead and Copper Rule, the PRS Monitoring Station data indicate a potential to develop biofilms and a potential for high release of particulate lead. Maximum lead concentrations in the Lead and Copper Rule sampling have been increasing over time. Trending analyses indicate that particulate aluminum in the water system may be a factor in the particulate lead release. Particulate lead may also trend with nitrite/nitrate concentration.

Cleaning of legacy chemical scales and biofilms would be beneficial.

Recommendations for Water System C are as follows:

- Plan for the removal of complete lead service lines.
- Make water main high velocity cleaning a priority. Without the pipe wall build-up of aluminum, iron, and biofilms, the influences on lead and copper release become less severe.
- Plan for the replacement of older and corroded water main. (Water System C is currently replacing mains installed from 1947 to 1966. This "spin-cast" pipe is the source of most main breaks).
- Investigate the possible influence of road salt on Lake Michigan water in the late winter/early spring. The influent chloride and possibly nitrate may be influencing particulate lead release and other water quality aspects.
- If there is a Lead and Copper Rule violation in the future, consider switching phosphate products to one with less or no polyphosphate included. For example, consider using a similar product to that of Water System A. The dose of orthophosphate could be increased without increasing the total phosphorus to the wastewater treatment plant. The current PO_4 concentration at the high water age location averaged 0.2 mg/L as PO_4. Using a 40% orthophosphate product, this is a concentration of 0.5 mg/L as PO_4 for total phosphorus. Using the 10/90 product that Water System A uses, the PO_4 dose could be increased to about 0.45 mg/L as PO_4, that is, the orthophosphate dose would be increased 2.25 times while maintaining the same total phosphorus load to the wastewater treatment plant. And, the polyphosphate fraction that can potentially hold metals in the water would essentially be eliminated.

Water System D

Table 11.7
Water System D: Historical timeline significant to existing water quality

Date Range	Event
1991	Two water systems, each consisting of 3 wells, were connected together
1995	A Vyredox system for iron and manganese control at Wells 3,4 and 5 was replaced with an ozone oxidation/pressure filtration system
6/1997	Lead and Copper levels found to be lower
Jan/Feb 2000	Filter media replaced
5/2004	Lead first exceeded the Lead and Copper Rule Action Level.
2006	Manganese found to be elevated in Well 2; polyphosphate feed adjusted to sequester its manganese which addressed customer complaints of discolored water; Well 2 use is minimized by designating it as the lag pump to Wells 1 or 6 lead
Apr/May 2006	Filter media replaced
5/2008	Temporary drop in lead and copper levels
12/2009	Copper first exceeded for Lead and Copper Rule
Jan 2011	Filter media replaced
Aug 2011	Lead and copper levels dropped below Action Level
Feb 2013	Filter media replaced
2012	Water quality investigation

Table 11.8
Water System D: Monitoring project timeline

ID	Date	Event
1	April 30, 2014	Startup of PRS Monitoring Station
2	May 01, 2014	Begin some modifications to water treatment plant
3	October 20, 2014	Well 5 out of service for rehabilitation; Flushed mains near PRS Monitoring Station on 10/7
4	November 14, 2014	Flushed mains near the PRS Monitoring Station
5	December 15, 2014	Well 5 back in service, Well 4 out of service for rehabilitation
6	March 20, 2015	2/26 Well 4 back in service; 3/3 Well 3 out of service; Well 3 back in service; 4/3 Lime feed has been removed and replaced by calcite tanks; New horizontal pressure filter arrived
7	August 25, 2015	High velocity flushing of water mains started
8	March 01, 2016	Optimization of treatment plant
9	June 01, 2016	Begin high velocity flushing of water mains
10	July 03, 2016	Finished high velocity flushing of water mains
11	September 20, 2016	Shutdown of PRS Monitoring Station
12	October 15, 2016	High velocity flushing of water mains

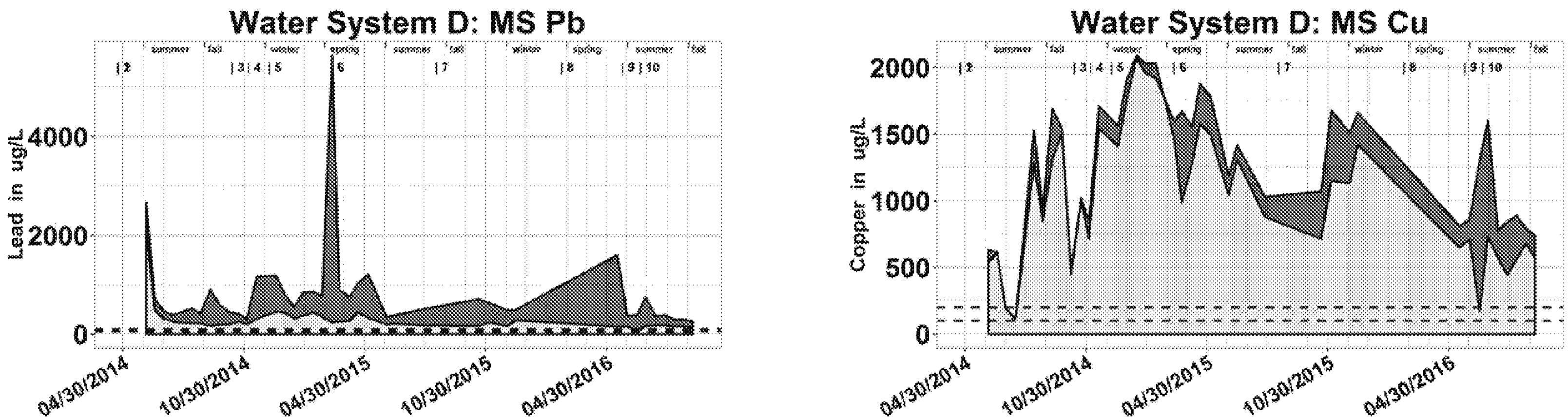


Figure 11.8 Water System D: Lead and copper release in PRS monitoring station test chambers

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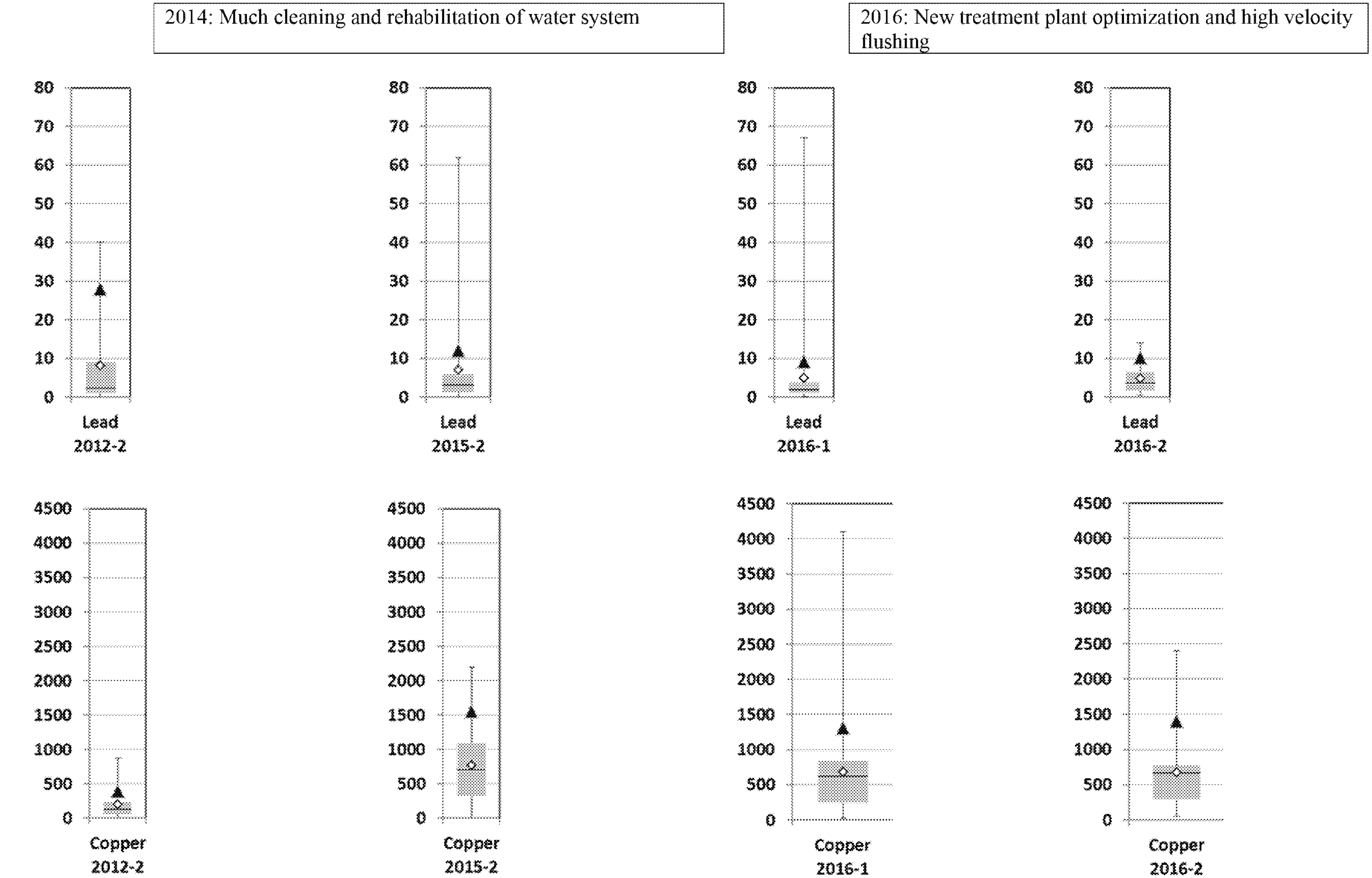


Figure 11.9 Water System D: Lead and Copper Rule data box and whisker plots

Water System D timelines of system changes and of monitoring project events are shown in Tables 11.7 and 11.8. Lead and copper release data are shown in Figures 11.8 and 11.9.

With better biostability from a refurbished water treatment plant and high velocity flushing of water mains, Lead and Copper Rule data show lower lead maximum and 90th percentile concentrations and lower copper maximum concentrations. However, copper 90th percentile concentrations are elevated just above the Action Level. A high concentration of polyphosphate in the water is suspected of holding dissolved lead and copper concentrations elevated. In addition, the biostability of the water can still be improved through the water treatment plant. Finally, uni-directional flushing of water mains is necessary to continue removing legacy scales.

Recommendations for Water System D are:

- Continue with routine water main high velocity cleaning. Plan for the replacement of older and corroded water main.
- Polyphosphates should be removed from the water system but the only way that the polyphosphates can be removed is to install a second iron and manganese removal plant to treat the collective water of the three independent wells. Then, the phosphate-based additive can be changed to an orthophosphate product at both the existing treatment plant and the proposed treatment plant. Because there are not resources to add another treatment plant, a strategy is being devised where the treated water side of the river will no longer receive water from the independent wells. The phosphate product of the water leaving the treatment plant will be switched to a higher orthophosphate fraction, possibly 90 to 100% orthophosphate. Some water from the west side treatment plant will continue to flow to the water system on the other side of the river so that the pipe underneath the river will not contain stagnating water. The two water types with the two phosphate products will be mixed together as a continuous blend. The polyphosphate will be kept at a high enough level to continue to sequester the iron and manganese from the independent wells on the east side.
- There are 107 lead service lines in the system. Make plans to remove those lines properly and completely. Then, the water system would no longer be considered a critical lead service line system. That would allow the water system to modify the orthophosphate dosage. When the lead is out of the system along with the iron and manganese and old chemical scales, slowly wean the system off of the orthophosphate dose. This can be monitored and informed by using the PRS Monitoring Station once again. Brass plates, copper plates with lead solder, and iron or galvanized iron plates can be used in the monitoring station test chambers to determine if issues would arise with lead and copper release from those materials remaining in the water system after lead service line removal.
- Track ATP at wells and clean the wells when ATP exceeds 1000 ME/mL (or before).
- Continue with routine monitoring of treatment plant finished water and replace or clean treatment media with increases in iron, manganese, turbidity, ATP, and dissolved organic carbon.

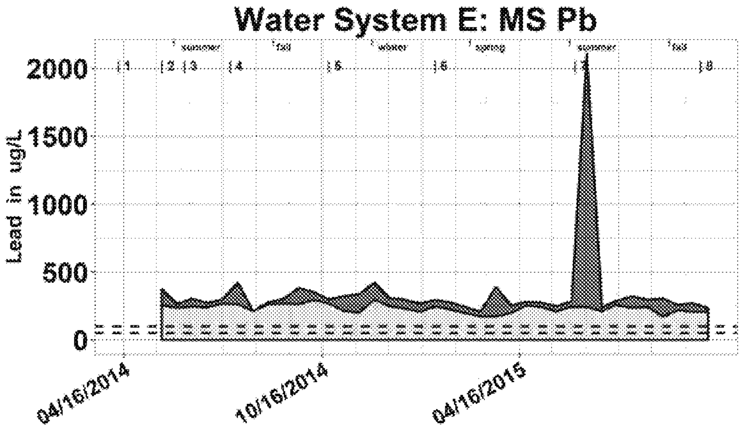
Water System E

Table 11.9
Water System E: Historical timeline significant to existing water quality

Date Range	Event
1969	Surface water treatment of adjacent small lake
3/2005	Connection of piping from a new well house to existing water main made
3/29/2006	New well and iron removal plant placed into operation (iron removal filter media was not up to specifications)
2006	Dramatic increase in copper pipe leaks; were some routinely before but greatly increased
2006	Investigation with recommendations
2012	Investigation after more pinhole leaks
2013	Rehabilitation of iron removal filter media

Table 11.10
Water System E: Monitoring project timeline

ID	Date	Event
1	April 16, 2014	Start PRS Monitoring Station
2	May 26, 2014	Start Clearitas at 0.5 ppm; begin summer months of building softener replacement and plumbing modifications and flushing
3	June 16, 2014	Increase Clearitas to 1.0 ppm
4	July 28, 2014	Increase Clearitas to 1.5 ppm
5	October 27, 2014	Increase Clearitas to 2 ppm
6	February 02, 2015	Increase Clearitas to 3 ppm
7	June 11, 2015	Increase Clearitas to 4 ppm
8	October 05, 2015	Stop PRS Monitoring Station



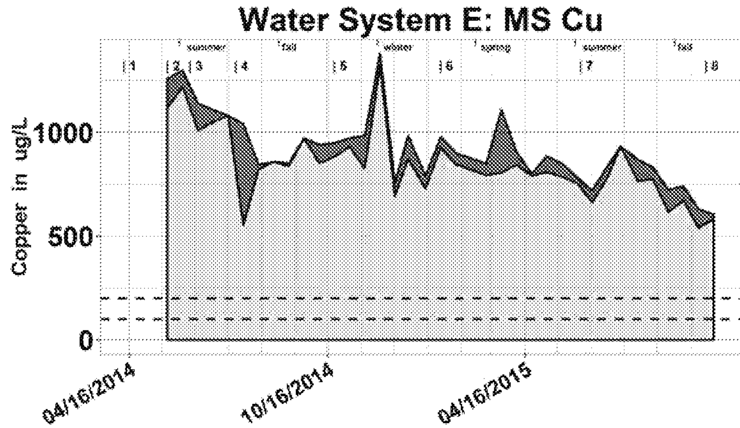


Figure 11.10 Water System E: Lead and copper release in PRS monitoring station test chambers

2014: Filter rehabilitation; system cleaning	September 2014: LCR sampling performed on sinks under renovation. Lead particulates released with turning of sink valves that had never been turned. Problem quickly remedied with line flushing.

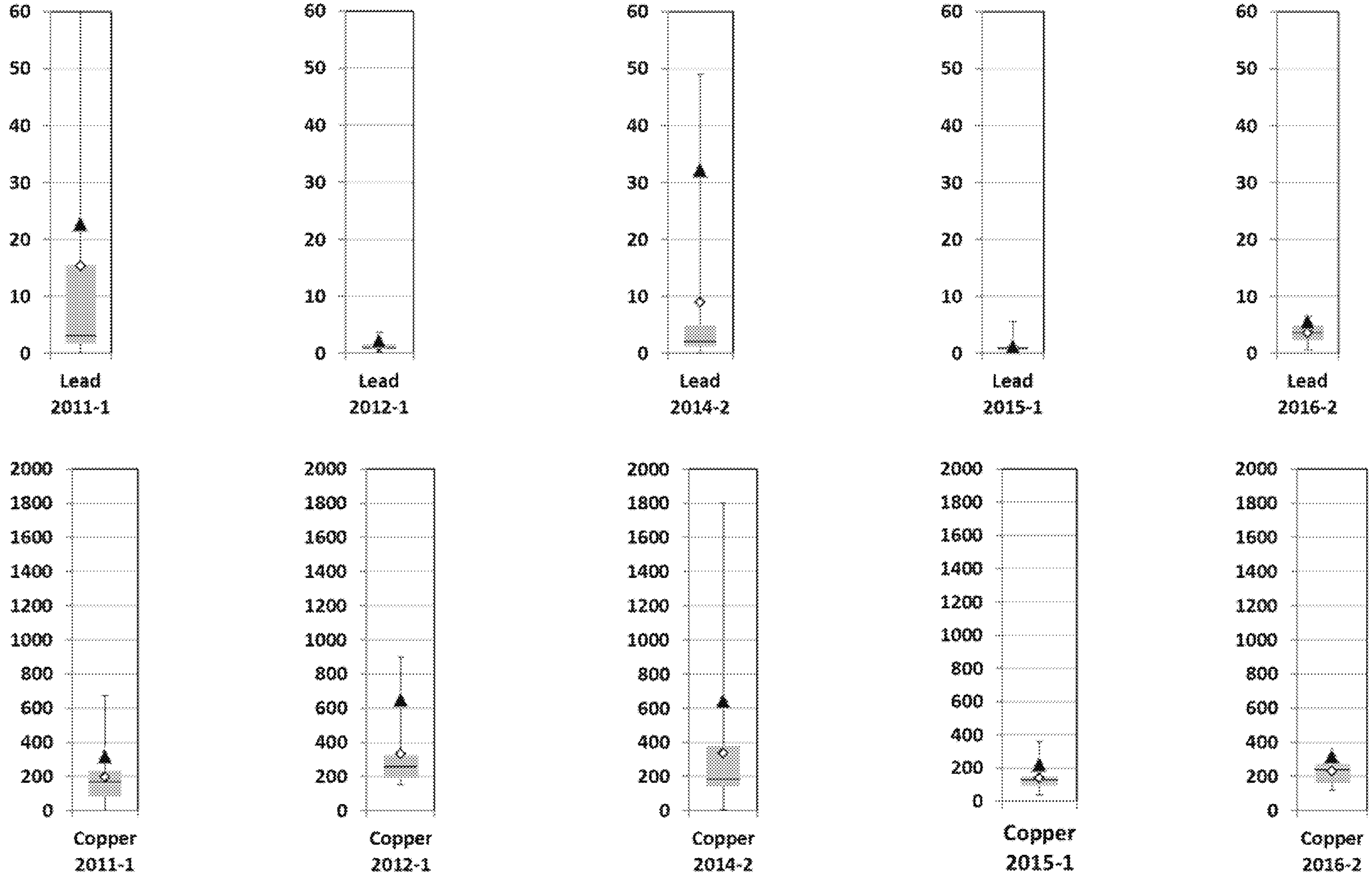


Figure 11.11 Water System E: Lead and Copper Rule data box and whisker plots

Water System E timelines of system changes and of monitoring project events are shown in Tables 11.9 and 11.10. Lead and copper release data are shown in Figures 11.10 and 11.11.

PRS Monitoring Station data showed that Water System E appears to be dependent on the water treatment filter performing with high iron and manganese removal and free of biofilms. It also appears to be dependent on the cleanliness of water softeners which, as newly installed, provided a barrier to issues developing in the water treatment filter. However, investigation of the old water softeners showed that the water softeners can turn into incubators of microorganisms with support of biofilm development and cause downstream microbiologically influenced corrosion, if they are not maintained.

The following actions were recommended to Water System E:

- Clean the main iron filter off-line to remove biofilms. The monitoring period ended and it took a year to gather the resources to clean the filter media and the wells. While customer satisfaction with the water had increased over the monitoring and rehabilitation period and pinhole leaks in copper piping had ceased, complaints of discolored water began to appear again waiting for the main iron filter to be cleaned.
- Routinely track turbidity and iron and manganese removal on the discharge of the iron filter and have the filter cleaned of biofilms when turbidity exceeds 1 NTU or less or iron or manganese levels increase.
- Track ATP at wells and clean them when ATP exceeds 1000 ME/mL or less.
- Routinely assess the dosing of the biofilm-removing chemical as to rate of debris removal and possible optimization of dosage
    - Monitor Total Coliform Rule sites for turbidity and free chlorine at the frequency of TCR sampling visits
    - Monitor entry points to buildings for turbidity and free chlorine once a week, especially if adjusting biofilm-removing chemical dosing
- Perform monthly blowdown of hot water tanks (about 3-minute blowdown or as determined by historical turbidity readings) and monthly turbidity readings
- Perform initial cleanup of water softeners as guided by ATP tests and then routine organic acid dosing approved for use with resins with regeneration at least every two weeks with ATP testing once or twice a year. Monthly ORP field tests are an easy way to track the cleanliness of the softener routinely.
- Continued routine flushing of building plumbing. In addition, a new air scouring technique is proving itself to be very effective in removing the legacy chemical scales and biofilms and would be useful in the campus buildings.
- Yearly, perform uni-directional flushing of water mains to turbidity <1 NTU with turbidity data for each flushing run. Higher biofilm-removing chemical levels in cleaning season should help with this.

Water System F

Table 11.11
Water System F: Historical timeline significant to existing water quality

Date Range	Event
2006	Well 4 constructed and placed online
2006	A 200,000-gallon reservoir added
After 2006	A high degree of plumbing equipment replacement reported, including copper piping and hot water heaters
2011	An increase in pinhole leaks in copper pipe
2011	Wells 3 and 4 serve the campus
2012	Health Services Unit building opened after a long construction period
	The building was found to have biofilms throughout the plumbing before occupancy with some pipe failure
2012	Water quality investigation of campus
4/2013	Investigation of wells
Winter 2014	Repair of Well 4 and rehab of Well 3

Table 11.12
Water System F: Monitoring project timeline

ID	Date	Event
1	August 26, 2014	Startup of PRS Monitoring Station
2	November 18, 2014	Water main break
3	March 24, 2015	Water main replacement begins; monitoring station continued but test chamber sampling on hold
4	August 01, 2015	Begin adding 0.5 ppm Clearitas

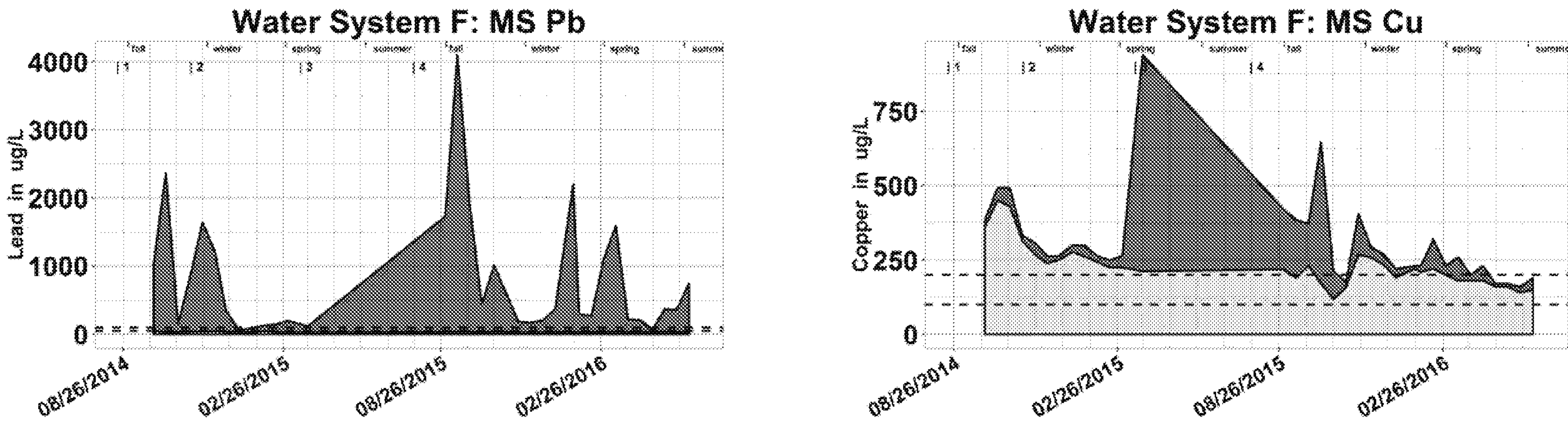


Figure 11.12 Water System F: Lead and copper release in PRS monitoring station test chambers

Data not shown here. Water System F has not been out of compliance with the Lead and Copper Rule. However, the system had a premise plumbing copper pipe pinhole leak issue.

Figure 11.13 Water System F: Lead and Copper Rule data

Water System F timelines of system changes and of monitoring project events are shown in Tables 11.11 and 11.12. Lead and copper release data are shown in Figures 11.12 and 11.13.

Well rehabilitation and the installation of new water mains appeared to lower microbiological populations in the water. The issue of particulate lead and copper release continued but damped out over time. Along with these improvements, the buildings were flushed and hot water tanks were blown down routinely. Pinhole leaks were no longer an issue on campus.

The following actions were recommended to Water System F:

- Track ATP at wells and clean them when ATP exceeds 1000 ME/mL or less.
- Routinely assess the dosing of the biofilm-removing chemical as to rate of debris removal and possible optimization of dosage
  - Monitor Total Coliform Rule sites for turbidity and free chlorine at the frequency of TCR sampling visits
  - Monitor entry points to buildings for turbidity and free chlorine once a week, especially if adjusting biofilm-removing chemical dosing
- Perform monthly blowdown of hot water tanks (about 3-minute blowdown or as determined by historical turbidity readings) and monthly turbidity readings
- Perform initial cleanup of water softeners as guided by ATP tests and then routine organic acid dosing approved for use with resins with regeneration at least every two weeks with ATP testing once or twice a year. Monthly ORP field tests are an easy way to track the cleanliness of the softener routinely.
- Continued routine flushing of building plumbing. In addition, a new air scouring technique is proving itself to be very effective in removing the legacy chemical scales and biofilms and would be useful in the campus buildings.
- Yearly, perform uni-directional flushing of water mains to turbidity <1 NTU with turbidity data for each flushing run. Higher biofilm-removing chemical levels in cleaning season should help with this.

Water System G

Table 11.13
Water System G: Historical timeline significant to existing water quality

Date Range	Event
2007	Well No. 4 drilled
2008	Exceeded Action Level for copper; phosphate dosing increased
2009	Re-sampling showed lower copper
2012	Exceeded Action Level for lead and copper
2013	Investigation performed on water system; plans made for cleaning and monitoring in water system
2013	Water system continued to be above Action Level for lead and copper
9/9/2013	Wells No. 3 and 4 out of service for partial rehabilitation
11/8/2013	Wells No. 3 and 4 back on-line with low quality water blocked
9/30/2014	Monitoring station installed in distribution system and monitoring/flushing plan put into action

Table 11.14
Water System G: Monitoring project timeline

ID	Date	Event
1	February 01, 2015	Wells No. 1 and 2 out of service for rehabilitation
2	March 05, 2015	Well No. 2 back on line; Well 1 abandoned; Well 4 out of service for rehabilitation on 3/9
3	April 01, 2015	Begin dosing biofilm removing chemical at 0.5 mg/L
4	June 01, 2015	Well No. 3 out of service for rehabilitation
5	August 01, 2015	Biofilm removing chemical dose increased to 0.1 mg/L
6	November 15, 2015	Building flushing frequency cut in half because of personnel shortage
7	December 01, 2015	Biofilm removing chemical dose increased to 2 mg/L. Phosphate dosage diluted to small percentage.
8	January 06, 2016	Well 3 put back in service on 12/22; Well 4 taken out of service on 12/28; Well 4 back in service on 1/4; On 1/6, Disruption of pipe scales from system-wide pressure gradient due to fire system inspection; immediate system flushing followed for control
9	February 04, 2016	Biofilm removing chemical dose turned off to let system scales settle down; increased flushing continued
10	March 02, 2016	Disruption to pipe scales after high disinfection dose
11	April 19, 2016	High velocity water main flushing attempted but water pressure loss occurred
12	May 16, 2016	Biofilm removing chemical is restarted at 0.5 mg/L; Reservoir was cleaned on 5/3; High velocity flushing of water mains is successful on 5/20
13	June 30, 2016	Lead and Copper Rule sampling is repeated and is below Action Level for lead and copper
14	September 20, 2016	Investigative Lead and Copper Rule sampling is performed and is below Action Level for lead and copper
15	October 20, 2016	High velocity flushing of water mains re-done
16	November 20, 2016	Lead and Copper Rule sampling is repeated

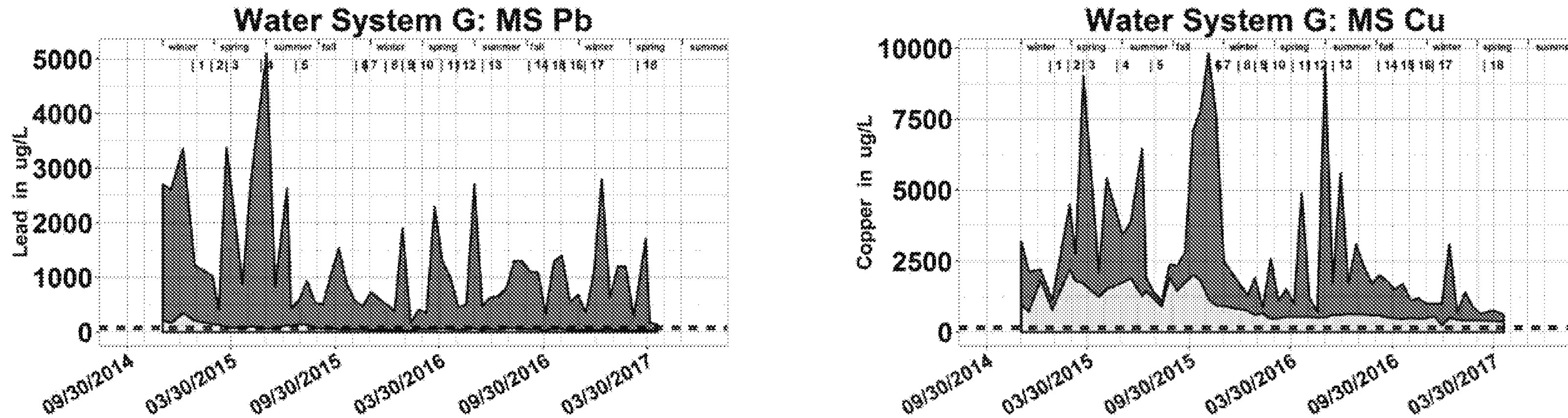


Figure 11.14 Water System G: Lead and copper release in PRS monitoring station test chambers

2014 well rehabilitation, reservoir cleaning, high velocity water main flushing, and building plumbing flushing and maintenance procedures.	2016 Three unrepresentative sample taps removed from Lead and Copper Rule sampling pool with regulators' approval.

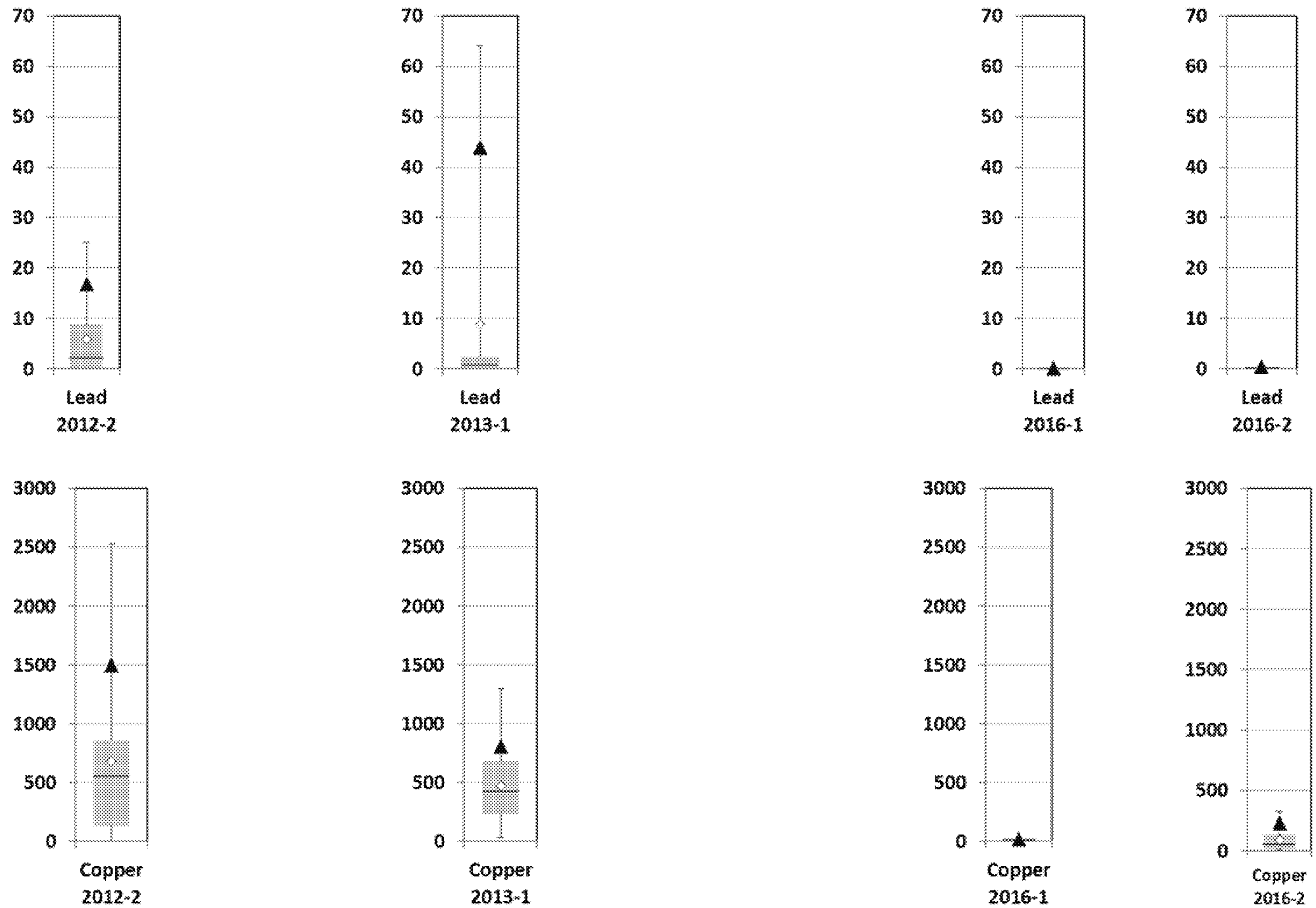


Figure 11.15 Water System G: Lead and Copper Rule data box and whisker plots

Table 11.15
Water System G: A comparison of 2013-1 Lead and Copper Rule data with and without unrepresentative sites

	Lead		Copper	
	All Sites	**Representative Sites Only**	**All Sites**	**Representative Sites Only**
Number of Sites	20	17	20	17
Maximum concentration	64	3.4	1300	1300
90th percentile concentration	44	2.6	812	818
Average concentration	9	0.93	473	534

Water System G timelines of system changes and of monitoring project events are shown in Tables 11.13 and 11.14. Lead and copper release data are shown in Figures 11.14 and 11.15.

There were three sites in the Lead and Copper Rule sampling pool that were not representative of water being consumed in the system. Regulators agreed that this was so. Ironically, if it were not for those three sites, the water system would be considered in compliance with drinking water regulations. The high degree of consumer complaints regarding discolored water would not have been acknowledged. The problem was a severe microbiological one initiating in the wells accompanied by high iron and manganese release from the wells. See Table 11.15 to compare data from all sampled Lead and Copper Rule sites versus data from only the sites that were representative of the consumers' water quality.

Recommendations for Water System G are:

- Track ATP at wells and clean them when ATP exceeds 1000 ME/mL or less.
- Routinely assess the dosing of the biofilm-removing chemical as to rate of debris removal and possible optimization of dosage
    - Monitor Total Coliform Rule sites for turbidity and free chlorine at the frequency of TCR sampling visits
    - Monitor entry points to buildings for turbidity and free chlorine once a week, especially if adjusting biofilm-removing chemical dosing
- Perform monthly blowdown of hot water tanks (about 3-minute blowdown or as determined by historical turbidity readings) and monthly turbidity readings
- Perform initial cleanup of water softeners as guided by ATP tests and then routine organic acid dosing approved for use with resins with regeneration at least every two weeks with ATP testing once or twice a year. Monthly ORP field tests are an easy way to track the cleanliness of the softener routinely.
- Continued routine flushing of building plumbing. In addition, a new air scouring technique is proving itself to be very effective in removing the legacy chemical scales and biofilms and would be useful in the campus buildings.
- Yearly, perform uni-directional flushing of water mains to turbidity <1 NTU with turbidity data for each flushing run. Higher biofilm-removing chemical levels in cleaning season should help with this.
- Phosphate addition has been eliminated. If a phosphate product must be used per regulations, eliminate the polyphosphate fraction, and only use orthophosphate.

Water System H

Table 11.16
Water System H: Historical timeline significant to existing water quality

Date Range	Event
2011	Out of compliance with LCR

Table 11.17
Water System H: Monitoring project timeline

ID	Date	Event
1	October 08, 2014	PRS Monitoring Station started
2	April 22, 2015	Clearitas started at 1 ppm
3	December 30, 2015	Clearitas increased to 2.5 ppm
4	May 16, 2016	Hydrants flushed
5	October 01, 2016	Water mains flushed again

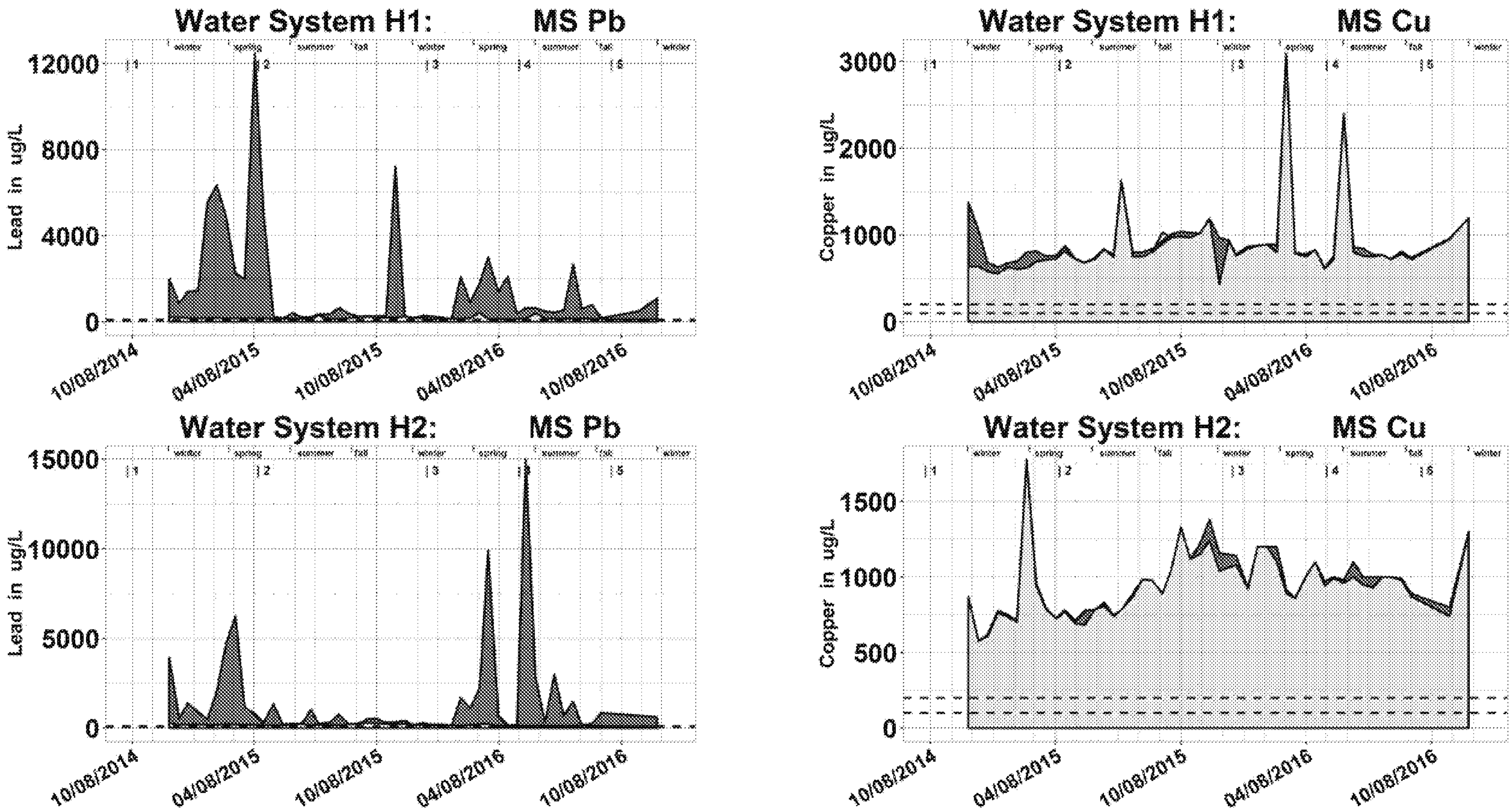


Figure 11.16 Water System H: Lead and copper release in PRS monitoring station test chambers

Water System H timelines of system changes and of monitoring project events are shown in Tables 11.16 and 11.17. Lead and copper release data are shown in Figures 11.16 and 11.17.

System cleaning has lowered the maximum lead and 90th percentile concentrations. However, copper concentrations have increased. The copper increase may be related to additional sampling sites with new copper piping installed. And, it may be related to the use of a high polyphosphate fraction product that holds metals in solution. And, it may be related to microbiological life cycles that influence corrosion of metals. The recommendations for Water System G apply to Water System H.

Cleaning and improvements begun

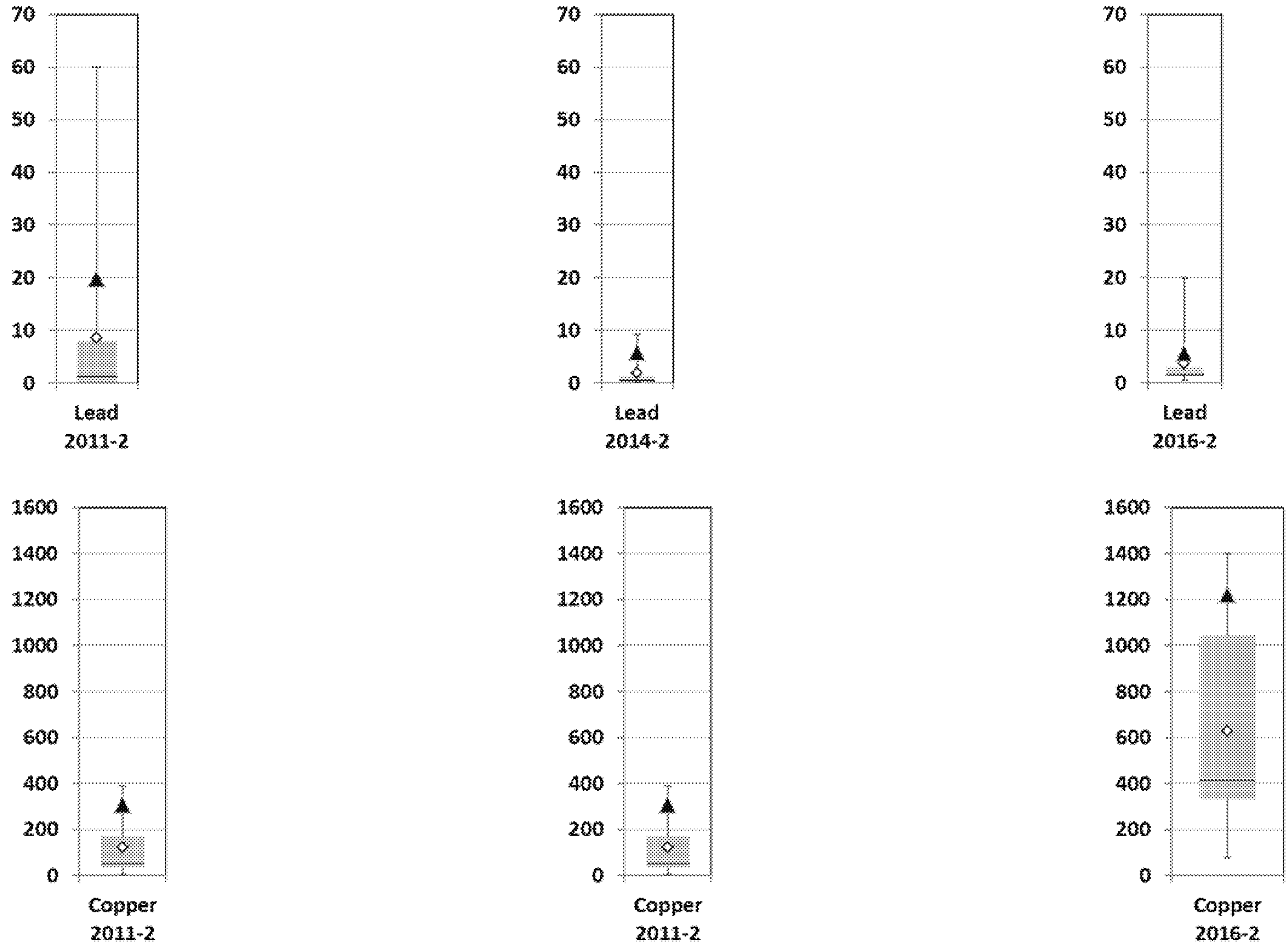


Figure 11.17 Water System H: Lead and Copper Rule data box and whisker plots

COMPARISON TO DISTRIBUTION SYSTEM DATA OF CHAPTER 4

In Chapter 4, disinfection concentrations and turbidity readings around some of the distribution systems were studied. These graphs are compared to patterns observed in the systems during the comprehensive study.

Water System A graphs of disinfection show that some locations experience a drop in disinfection level during the peak nitrification period in September, October, and November. Other sites appear to be immune to this. The PRS Monitoring Station data showed how nitrification affects lead and copper release in the water system. With this knowledge, the sites with and without nitrification patterns as identified from the disinfection graphs of Chapter 4 should be compared to see if there is something operational that could be done to minimize or stop nitrification during the warmer weather months at all sites.

The turbidity graphs offer the same opportunity to determine why there is great variation in turbidity at some sites in Water System A and not at others. Fifty percent of the lead that reaches consumers can be in particulate form as identified by the monitoring station data. Determining cleaning and operations routines that can lower the turbidity could protect consumers from sporadic contact with lead in the drinking water.

In Water System B, there were big variations in disinfection concentration at the distribution system sites. This should be investigated. Looking at the disinfection time series graphs, disinfection concentration made an improvement after the first summer of high velocity flushing and has stayed at this slightly higher level. In addition, there were very large variations in turbidity at some sites. Likewise, this should be investigated. This might be a result of the flushing program, but that should be determined and it should be checked that turbidity has returned to low values. Looking at turbidity time series graphs for the distribution system sites, there are sporadic turbidity peaks even outside of the cleaning season. Monitoring station data links high turbidity and low disinfection levels to a higher potential of lead and copper release with turbidity related to aluminum scale from coagulant use, iron and manganese scale from intermittent groundwater use, and a pattern of nitrification and biofilms that affect both dissolved and particulate lead and copper release.

In Water System C, chlorine concentrations and turbidity levels appear to be in good ranges. However, the lowest chlorine sites and the highest turbidity sites should still be investigated. Most important is investigating the sites with the greatest variations. Even though the turbidity is recorded as <1 NTU, why do the turbidity peaks occur? It could be operational or it could be related to sampling protocol. However, monitoring station data identify a high potential for particulate lead release. Lead and Copper Rule data identify an upward trend of lead release.

Water System I was in good control of disinfection levels and turbidity levels. Like every system, it would benefit by fine tuning that control in investigating sites of low disinfection and high turbidity and sites with high variations of parameters. The time series graphs show typical patterns in disinfection and turbidity that have been seen in PRS Monitoring Station studies where nitrification is occurring including Water System A in this project. Water System I is a chloraminated water system with a potential for nitrification similar to Water System A.

SUMMARY

In this project, it was desired to comprehensively monitor water systems before, during, and after water system cleaning efforts to capture any changes to lead and copper release in test chambers of a distribution system monitoring station. The timing of rehabilitation efforts and installation of the monitoring station did not always coordinate. In addition, some plans for cleaning efforts could not be carried out. Nevertheless, the comprehensive monitoring data provided many clues as to what shaped the water quality, including dissolved and particulate lead and copper release, in each water system. This system of monitoring provided the means to cautious empirical experimentation for water quality improvement in water systems and documentation of successful system operations.

Cleaning and biostability improvement efforts appeared to lower lead and copper concentrations overall in the project water systems. Results are summarized in Tables 11.18 to 11.20.

Cleaning efforts – flushing and the use of a biofilm-removing chemical – can potentially release pipe wall accumulations too quickly and temporarily create water quality issues in the distribution system. Even biostability efforts that cut off food supplies for microorganisms can cause a sloughing of biofilms and materials from pipe walls. For this reason, cleaning and biostability improvement efforts must be performed at a controlled pace and with a thoroughness that will minimize temporary disturbances of water quality. Monitoring of turbidity and disinfection concentration data history in the distribution system and throughout problematic buildings, if possible, can guide cleaning efforts.

Table 11.18
Lead and Copper Rule data: Lead

Water System	Year-Semester	90th Percentile	Maximum	Actions Taken
A	2006-2	12	28	
	2009-2	6.3	20	After change to orthophosphate from poly blend and chloramine
	2012-2	8.0	8.8	
	2015-2	9.1	15.0	
B	2012-1	27	490	
	2016-1	15	53	After two seasons of high velocity flushing
	2016-2	18	38	
	2017-1	12	41	
C	2005-2	4.5	6.9	
	2008-2	8.9	21	
	2011-2	6.7	54	
	2014-2	6.9	100	
D	2012-2	28	40	
	2015-2	12	62	After initial system improvements
	2016-1	9.1	67	After system improvements and high velocity flushing
	2016-2	10	14	
E (a pinhole leak system)	2011-1	23	160	
	2011-2	11	14	
	2012-1	2.3	3.7	
	2013-2	5.2	5.3	
	2014-2	32	49	Construction particulate release
	2015-1	1.3	5.6	After system improvements
	2015-2	6.3	7.8	
	2016-2	5.6	6.5	
F (a pinhole leak system)	2008-1	5.2	5.9	
	2011-2	2.9	4.7	
	2014-2	3.6	6.4	Begin system improvements
G	2008-2	4.1	11	
	2009-1	5.9	18	
	2009-2	1.6	3.7	
	2010-1	2.9	6.4	
	2010-2	1.2	2.1	
	2011-1	1.4	1.9	
	2011-2	5.1	14	
	2012-2	17	25	
	2013-1	44	64	
	2016-1	0.26	0.46	After system improvements but also different sites
	2016-2	0.56	0.68	
H	2011-2	20	60	
	2012-1	0.6	1.7	
	2012-2	0.2	0.7	
	2013-2	0.6	0.8	
	2014-2	5.8	9.2	
	2015-2	3.2	4.4	After system improvements
	2016-2	5.6	20	

Table 11.19
Lead and Copper Rule data: Copper

Water System	Year-Semester	90th Percentile	Maximum	Actions Taken
A	2006-2	70	250	
	2009-2	65	190	After change to orthophosphate from poly blend and chloramine
	2012-2	79	190	
	2015-2	48	110	
B	2012-1	400	1100	
	2016-1	710	1100	After two seasons of high velocity flushing
	2016-2	570	1100	
C	2005-2	110	200	
	2008-2	160	690	
	2011-2	118	130	
	2014-2	102	260	
D	2012-2	390	870	
	2015-2	1550	2200	After initial system improvements
	2016-1	1310	4100	After system improvements and high velocity flushing
	2016-2	1410	2400	
E (a pinhole leak system)	2011-1	320	670	
	2011-2	380	490	
	2012-1	652	900	
	2013-2	327	840	
	2014-2	642	1800	Construction particulate release
	2015-1	220	360	After system improvements
	2015-2	310	340	
	2016-2	320	320	
F (a pinhole leak system)	2008-1	240	270	
	2011-2	200	250	
	2014-2	260	260	Begin system improvements
G	2008-2	2030	2300	
	2009-1	1124	2100	
	2009-2	1600	1700	
	2010-1	1000	1100	
	2010-2	1300	1900	
	2011-1	1100	1200	
	2011-2	1700	4100	
	2012-2	1500	2500	
	2013-1	812	1300	
	2016-1	250	440	After system improvements but also different sites
	2016-2	230	330	
H	2011-2	300	390	
	2012-1	64	390	
	2012-2	63	110	
	2013-2	77	310	
	2014-2	140	170	
	2015-2	66	100	After system improvements
	2016-2	1200	1400	Changed sites to new copper

Table 11.20
Summary of cleaning and biostability improvement effort results

Water System	Cleaning and Biostability Improvement Efforts	Monitoring Station Data Results	Lead Compliance Data Results	Copper Compliance Data Results
K	After one cleaning season of water main high-velocity flushing	Not Applicable	90th percentile lowered to below Action Level; subsequent years lowered around 5 µg/L; maximum lowered	Lower maximum and slightly lower 90th percentile
A	No significant water system cleaning	Distinct nitrification patterns of lead and copper release; continuing high relative percentage of particulate lead release observed	Slow increase of maximum and 90th percentile over time	Relatively constant maximum and 90th percentile within some variation
B	Engineered high-velocity flushing program; later special biostability study that identified potential source of ammonia and acetate production in the water; only performed two years of the water main flushing program but should have continued the third year in order to further control biofilms and aluminum, iron, and manganese chemical scales	Lowering of dissolved lead; constant higher copper	Brought down maximum and 90th percentile lead.	Maximum has stayed constant; 90th percentile fluctuates slightly up and down.
C	None	Water forms low dissolved lead and dissolved copper and particulate copper with possibly seasonal variation; particulate lead release can be high.	Low 90th percentiles; maximums have increased over time	Low maximums and 90th percentiles
D	Well rehabilitation; water treatment plant renovation for iron, manganese, and organic carbon removal; high-velocity flushing of water mains. Suspect lead and copper solubility with polyphosphate product.	Lowered dissolved and particulate lead and copper	Greatly lowered max and 90th percentile	Lower maximum but higher 90th percentile

(continued)

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Table 11.20 Continued

Water System	Cleaning and Biostability Improvement Efforts	Monitoring Station Data Results	Lead Compliance Data Results	Copper Compliance Data Results
E	Iron and manganese filter renovation; dosing of biofilm-removing chemical; installation of new all water softening in buildings; high-velocity flushing of water mains; *building maintenance package	Lowered particulate lead and copper and dissolved copper	Maximum and 90th percentile dependent on localized particulate release events the potential for which has been lowered.	Lowered maximum and 90th percentile
F	Well rehabilitation; water main replacement; dosing of biofilm-removing chemical; *building maintenance package	Dissolved lead already low; lowered dissolved copper and particulate lead and copper; pinhole leak epidemic ended	Not ever out of compliance with Lead and Copper Rule	Not ever out of compliance with Lead and Copper Rule
G	Well rehabilitation; dosing of biofilm-removing chemical; high-velocity flushing of water mains; service line flushing; *building maintenance package	Lowered dissolved lead, dissolved copper, and particulate copper. Particulate lead is lower but still quite variable.	Data similar to previous data with unrepresentative sites removed	Maximum and 90th percentiles have been lowered.
H	Well rehabilitation; dosing of biofilm-removing chemical; high-velocity flushing of water mains; *building maintenance package	Dissolved lead and particulate copper were already low. Lowered particulate lead. Dissolved copper higher.	Maximum and 90th lowered.	Maximum and 90th increased but not over Action Level.

*Building maintenance package includes routine flushing of building piping; routine hot water tank blowdown, routine softener cleaning with organic acid being instituted.

CHAPTER 12
PHOSPHORUS ENVIRONMENTAL IMPACT ANALYSES

In Wisconsin, where this project's participating water utilities were located, three administrative code chapters apply to controlling phosphorus discharges to the environment. Natural Resources (NR) 102.06 discusses setting water quality criteria for Wisconsin's waters.

NR 217 explains the setting of effluent limits for point sources. There are three types of effluent limits: water-quality based (the concentration that a natural body of water can receive without environmental damage), technology-based limits (the concentration that is technologically possible to achieve), and Total Maximum Daily Load (TMDL). A TMDL is the total mass of pollutant a body of water can receive without affecting its water quality. This limit can be used as a "budget" for a body of water where dischargers to the same body of water can trade or manage pollutant contributions as long as the budget is not exceeded.

NR 151 addresses runoff management (non-point sources) including nutrient management, such as for phosphorus. (WDNR 2012)

The phosphorus standards were published in the Wisconsin Administrative Code on December 1, 2010. Since that time, the Wisconsin Pollution Discharge Elimination System (WPDES) permits are being re-evaluated before renewal to determine if modification for more stringent phosphorus limits is needed. (WDOA and WDNR 2015)

Phosphorus removal at wastewater treatment facilities is achieved by means of chemical precipitation or biological treatment or a combination of both (Rodgers 2014). There are advantages and disadvantages to both technological means of phosphorus removal and a combination of the methods can minimize disadvantages (Tanyi 2006).

There are also other strategies available where a compliance deadline can be extended if progress toward meeting a discharge limit requires more time (variance), where adaptive management plans achieve water quality criteria for a body of water by balancing all point and non-point source discharges, or where point sources can trade discharge limits as practicable for each entity (WDNR 2012; WDOA and WDNR 2015).

In general, many wastewater treatment agencies are being required to meet increasingly stringent phosphorus criteria in their respective National Pollution Discharge Elimination System (NPDES) permits. Whatever the permitting mechanism, the result is a phosphorus discharge limit that is protective of the next downstream reach in the natural body of water that receives the discharge. Lower limits may force a wastewater treatment facility to implement a new technology to be deemed compliant. In this instance, a wastewater treatment facility would finance the capital expenditure but transfer the fiscal burden to the rate-paying public.

Tangible costs of phosphorus removal from wastewater include plant modifications that must be considered as phosphate loading increases, such as wastewater processing tank volume and solids storage volume (Tanyi 2006). In addition, annual operations costs include chemical addition, energy usage, solids processing, and solids disposal (Tanyi 2006). More sludge is produced by chemical treatment than by biological treatment requiring more solids storage, processing, and disposal and more chemicals being used (Tanyi 2006). However, more energy is used for the biological process and the anaerobic zone in wastewater processing tanks needs a larger volume than in chemical precipitation (Tanyi 2006). To attain very low discharge phosphorus levels, the chemical precipitation method must be used in addition to the biological removal method (B&V 2014).

Details of phosphorus concentrations and sources found in wastewater, environmental damage measured around the United States, regulations controlling phosphorus discharge from wastewater treatment plants, and removal methods can be found in summary documents available from the EPA and the American Water Works Association (EPA 2010, B&V 2014). This chapter uses findings from the summaries and other documents to calculate the effect of increasing dosages of phosphate in some of the participating water utilities of this project on their associated wastewater treatment facilities.

Information on current phosphorus loading at each wastewater treatment facility associated with this project's participating drinking water utilities was obtained by means of a survey and by direct communication with the facilities' managers. Key information included:

- Monthly influent wastewater flow for 2013, 2014, and 2015
- Monthly average influent phosphorus concentration for 2013, 2014, and 2015
- Monthly effluent wastewater flow for 2013, 2014, and 2015
- Monthly average effluent phosphorus concentration for 2013, 2014, and 2015
- Current and future phosphorus discharge limits
- List of municipal water systems that contribute to the wastewater flow

WASTEWATER TREATMENT FACILITY ASSOCIATED WITH WATER SYSTEMS A, I, AND J

The wastewater treatment facility associated with Water Systems A, I, and J consists of two separate plants. Calculations were performed for both plants, summed together as a facility total, and data averaged over the years 2013, 2014, and 2015. Table 12.1 shows the influent and effluent phosphorus loading.

Table 12.1
Total phosphorus loadings for wastewater treatment facility associated with Water Systems A, I, and J

Item Measured	Units	Average over 2013, 2014, 2015
Influent Flow	l/yr	250,000,000,000
Influent Phosphorus Mass	kg/yr	1,040,000
Effluent Flow	l/yr	264,000,000,000
Effluent Phosphorus Mass	kg/yr	104,000
Residuals Phosphorus Mass	kg/yr	941,000
Phosphorus Removal	%	90

In comparison to previous studies performed at the wastewater treatment facility, Table 12.1 results are reasonable. Previously, a residual phosphorus mass was calculated as 1,150 tons per year (1,043,262 kg/yr). An average phosphorus removal was calculated for 2004 to 2011 as 86.5% for one plant and 92.8% for the second plant with an average of the two of 89.6%.

The contribution of municipal drinking water to the wastewater flow and phosphorus loading is estimated in Table 12.2. Data for 2013, 2014, and 2015 were averaged for these calculations. Information on drinking water pumpage to distribution systems came from the Wisconsin Public Service Commission annual reports submitted by drinking water utilities. Phosphate dosing came from the Wisconsin Department of Natural Resources operations data submitted by drinking water utilities monthly and from phosphate concentrations measured in Water System A.

Regarding phosphate dosages in drinking water, drinking water utilities personnel refer to the dosages of orthophosphate in units of mg/L as PO_4. Even though some corrosion control products include a fraction of phosphate in the form of polyphosphate, it is only the orthophosphate fraction that participates in corrosion control. In addition, the field equipment used to measure the phosphate dosages only measures the orthophosphate fraction. Therefore, there can be more total phosphate in the water than just the stated or measured orthophosphate concentration. In order to translate a drinking water orthophosphate dosage into total phosphorus arriving at a wastewater treatment facility, the dosage as mg/L as PO_4 must first be divided by the ratio of molecular weights of PO_4 to P, which is 95/31=3.0645. Then the polyphosphate to orthophosphate ratio must be used to determine the total phosphorus in the water. For example, Water System J doses orthophosphate at 0.31 mg/L as PO_4 in the drinking water using a product where polyphosphate to orthophosphate is 60/40. The total phosphorus in the water is 0.31/ (3.0645 x 0.4) = 0.25 mg/L as P.

In Table 12.2, an estimate of phosphorus contribution was made for other municipalities outside of the municipalities in this study. It has been noted that typical phosphate dosages for drinking water systems range from 0.7 to 2 mg/L as PO_4 (0.22 to 0.65 mg/L as P) (Rodgers 2014). Anecdotally in Wisconsin, it is typical to see a dosage of around 0.3 mg/L as PO_4 (0.1 mg/L as P) and the use of a product where the poly/ortho ratio is 60/40. For the calculation in Table 12.2, a dosage of 0.3/(3.0645 x 0.4) = 0.25 mg/L as P was used. Water System I's dosage of 1.9 mg/L as PO_4 using phosphoric acid is atypical for Wisconsin.

The municipal contribution to the total phosphorus for this wastewater treatment facility was found to be 6%. A previous study at the wastewater treatment facility found the municipal contribution to be 22%, however, the phosphate dosing units were in mg/L as PO_4 but used in the calculation as P. Therefore, the previous finding is really 22%/3.0645 = 7.2%, closer to the calculations in this study. Other smaller variations in the results between the two studies are from using municipal drinking water flows and dosages from different years.

In comparison to studies at other wastewater facilities, one study found a range of municipal contributions of phosphorus to wastewater treatment facilities for ten water systems to range from 10 to 35% (B&V 2014). Cleveland, Ohio, calculations resulted in a current contribution of 10% but a regulatory increase of phosphate chemical would raise the contribution to 27% (Rodgers 2014).

Table 12.3 explores the effect of possible regulatory increases to the phosphate dose in drinking water on the wastewater treatment facility associated with this project's Water Systems I, J, and A. Guidance for corrosion control in 2016 was to use a dosage of 1 to 3 mg/L as PO_4 (0.3 to 1.0 mg/L as P) unless 3.5 mg/L as PO_4 (1.2 mg/L as P) is needed to control lead release from lead service lines, to control copper corrosion from new copper pipe, or if aluminum, iron, or manganese is present in the water (EPA 2016a). This is a guidance directive from EPA that could possibly become a regulatory directive in a revision of the Lead and Copper Rule.

Table 12.3 compares the phosphorus loading that will need to be addressed by the wastewater treatment facility if the municipal phosphorus loading is increased. The municipal loading of phosphorus would increase from 6% up to 20%. Note that the larger Water System I already uses a phosphate dosage of 1.9 mg/L as PO_4 (0.62 mg/L as P), so that phosphorus mass changes do not become significant at this wastewater treatment facility until that dose is exceeded by regulatory requirements. The wastewater treatment facility would be within the current and future phosphorus discharge limits through the highest drinking water phosphate dosage.

Table 12.2
Municipal phosphorus loadings for wastewater treatment facility associated with Water Systems A, I, and J

Item Measured	Units	Average over 2013, 2014, 2015	Source of Information
Influent Flow	l/yr	250,000,000,000	See Table 12.1
Inflow and Infiltration	l/yr	117,000,000,000	WWTF: 85 MGD for I/I
Remaining Wastewater Flow	l/yr	133,000,000,000	By subtraction
Flow from Water System I	l/yr	74,000,000,000	WPSC: drinking water flows WWTF: 35% of municipal flow is used for landscaping and cooling and does not enter the treatment plant
Flow from Water System J	l/yr	2,170,000,000	
Flow from Water System A	l/yr	2,740,000,000	
Other municipalities	l/yr	54,000,000,000	By subtraction
Phosphorus Dose from Water System I	mg/L as P	0.62	WDNR: Dose is 1.9 mg/L as PO_4 using a product with 100% of phosphorus as orthophosphate
Phosphorus Dose from Water System J	mg/L as P	0.25	WDNR: Dose is 0.31 mg/L as PO_4 using a product with 40% of phosphorus as orthophosphate and 60% as polyphosphate
Phosphorus Dose from Water System A	mg/L as P	0.25	WDNR: Dose is 0.69 mg/L as PO_4 using a product with 90% of phosphorus as orthophosphate and 10% as polyphosphate
Influent Phosphorus Load	kg/yr	1,040,000	See Table 12.1
Phosphorus Load from Water System I	kg/yr	45,900	Flow x Dose x 10^(-6)
Phosphorus Load from Water System J	kg/yr	550	
Phosphorus Load from Water System A	kg/yr	685	
Phosphorus Load from Other Municipalities	kg/yr	13,500	Assuming dose of 0.25 mg/L as P. See discussion in report.
Phosphorus Load from Other Sources	kg/yr	980,000	Subtraction of municipal load from influent load
Municipal Phosphorus Load	% of influent phosphorus load	6	

1.WWTF=wastewater treatment facility associated with Water Systems A, I, and J where a phosphorus study and flow studies have been performed in the past
2. WPSC= Wisconsin Public Service Commission; drinking water utilities submit annual reports on operations parameters and costs where flows to distribution systems were obtained for 2013, 2014, 2015. Flow used in calculations: flow quantity entering the distribution system minus non-revenue quantity for fire flows, flushing, etc. 65% of the calculated flow was used for this wastewater treatment facility based on facility estimates
3. WDNR= Wisconsin Department of Natural Resources operations data submitted by drinking water utilities monthly for 2013, 2014, 2015

Table 12.3
Municipal phosphorus loadings for wastewater treatment facility associated with Water Systems A, I, and J with increased drinking water phosphate dosages

Item Measured	Units	Current Phosphorus Dosing	Minimum of 1 mg/L as PO_4	Minimum of 3 mg/L as PO_4	Minimum of 3.5 mg/L as PO_4
Water System I	kg/yr	45,900	45,900	72,400	84,400
Water System J	kg/yr	550	1,770	5,310	6,200
Water System A	kg/yr	685	994	6,710	7,820
Other Municipalities	kg/yr	13,500	35,100	132,000	153,000
Other Phosphorus Sources	kg/yr	980,000	980,000	980,000	980,000
Total Influent Phosphorus Load	kg/yr	1,040,000	1,060,000	1,200,000	1,230,000
Municipal Phosphorus Load	% of influent phosphorus load	6	8	18	20
Residuals Phosphorus Mass (90% removal)	kg/yr	936,000	954,000	1,080,000	1,110,000
Effluent Phosphorus Mass (10% remains)	kg/yr	104,000	106,000	120,000	123,000
Effluent Phosphorus Concentration (264x10^9 L/yr)	mg/L	0.39	0.40	0.45	0.47
Current Phosphorus Discharge Limits	mg/L	0.66 minimum			
Future Phosphorus Limits	mg/L	0.66 minimum			
Increase of Phosphorus Removed	kg/yr	0	18,000	144,000	174,000
	lb/yr	0	39,700	318,000	384,000
Chemical Costs to Remove Increased Phosphorus	$/yr: $0.53/lb Fe x 2.2 lb Fe/lb P removed	$0	$46,300	$370,000	$447,000

1. See Table 12.2 for municipal wastewater flows and initial dosages.
2. Chemical costs were previously calculated by the wastewater treatment facility.

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The cost of removing phosphorus from the wastewater was previously calculated by the associated wastewater treatment facility. It was found through operations data that 2.2 pounds of iron were required per each pound of phosphorus removed. This compares to findings of others that chemical precipitation dosages of 1.5 to 2.0 moles of a metal dose, such as iron, per mole phosphorus in the plant influent is typical for removing 80 to 98 percent of the phosphorus (EPA 2010). The phosphorus removed from the wastewater is 90% of the influent phosphorus for this wastewater treatment facility. The ratio of iron to phosphorus in moles can be converted to weight by means of pounds per pound-mole, where mole weights are 56 and 31, respectively. The mole ratio given above translates to (1.5 x 56) / 31 = 2.7 pounds iron for each pound influent phosphorus." Reaching lower limits with chemical precipitation requires a dose on the order of 6 to 7 moles of metal per mole influent phosphorus (EPA 2010).

It was also found at this wastewater treatment facility that it costs $0.53 per pound of iron. Those findings were used to calculate the additional chemical costs for the increased phosphorus loading associated with each regulatory dosage change. In Table 12.3, it is seen that additional chemical costs alone would rise to $447,000 per year for the maximum dosage of 3.5 mg/L as PO_4 (1.14 mg/L as P). Other costs would be incurred for sludge storage, processing, and disposal.

WASTEWATER TREATMENT FACILITY ASSOCIATED WITH WATER SYSTEM K

Similar calculations were performed for the wastewater treatment facility associated with Water System K as shown in Tables 12.4, 12.5, and 12.6. Only one municipal water system, Water System K, contributes to the wastewater influent. The drinking water pumpage into the distribution system was known from Wisconsin Public Service Commission annual reports. It is not known what percentage of municipal water enters the wastewater treatment facility, so calculations shown here assume 100% of the flow and give a conservative estimate of phosphorus impact.

The wastewater influent from sources other than the municipal flow was attributed to a high infiltration and inflow, especially from private property drainage which the wastewater manager identified as a significant contribution. Whey is also sent from a local cheese factory.

Water System K does not add phosphate to the drinking water, so the total phosphorus mass at the wastewater treatment plant is from non-municipal sources.

Table 12.6 shows the additional phosphorus loading if Water System K began dosing the drinking water with orthophosphate. Note that these calculations assume that an orthophosphate product would be used where there was no polyphosphate fraction. If a poly/ortho ratio of 50/50 product were used, the phosphate mass contributed from the drinking water would double from a maximum of 8.5% of influent phosphorus to 17%.

The greatest challenge at this facility is meeting the future phosphorus discharge limit of 0.075 mg/L as P, regardless of a drinking water phosphorus dose. The facility has recently begun operating a biological phosphorus removal system which has lowered the effluent phosphorus concentration to 0.17 mg/L as P. There is hope that the rest of the phosphorus removal obligation can be achieved by trading pollution credits with other sources in the watershed. This step will be determined as soon as the Total Maximum Daily Load has been determined by the regulatory agency.

Table 12.4
Total phosphorus loadings for wastewater treatment facility associated with Water System K

Item Measured	Units	Average over 2013, 2014, 2015
Influent Flow	l/yr	4,220,000,000
Influent Phosphorus Mass	kg/yr	28,400
Effluent Flow	l/yr	4,220,000,000
Effluent Phosphorus Mass	kg/yr	3,580
Residuals Phosphorus Mass	kg/yr	24,800
Phosphorus Removal	%	87

Table 12.5
Municipal phosphorus loadings for wastewater treatment facility associated with Water System K

Item Measured	Units	Average over 2013, 2014, 2015	Source of Information
Influent Flow	l/yr	4,220,000,000	See Table 12.4
Inflow and Infiltration + Cheese Factory	l/yr	1,900,000,000	By subtraction of Influent Flow – Municipal Flow
Flow from Water System K	l/yr	2,320,000,000	WPSC: drinking water flows Assumption: 100% of municipal flow enters the treatment plant
Phosphorus Dose from Water System K	mg/L as P	0	No phosphate dosing
Influent Phosphorus Load	kg/yr	28,400	See Table 12.4
Phosphorus Load from Water System K	kg/yr	0	Flow x Dose x 10^(-6)
Phosphorus Load from Other Sources	kg/yr	28,400	Subtraction of municipal load from influent load
Municipal Phosphorus Load	% of influent phosphorus load	0	

WPSC= Wisconsin Public Service Commission; drinking water utilities submit annual reports on operations parameters and costs where flows to distribution systems were obtained for 2013, 2014, 2015

Table 12.6
Municipal phosphorus loadings for wastewater treatment facility associated with Water System K with increased drinking water phosphate dosages

Item Measured	Units	Current Phosphorus Dosing	0.3 mg/L as PO_4	1 mg/L as PO_4	3 mg/L as PO_4	3.5 mg/L as PO_4
Water System K Phosphorus Load	kg/yr	0	227	755	2,270	2,640
Other Phosphorus Sources	kg/yr	28,400	28,400	28,400	28,400	28,400
Total Influent Phosphorus Load	kg/yr	28,400	28,600	29,100	30,700	31,000
Municipal Phosphorus Load	% of influent phosphorus load	0	0.8	3	7	8.5
Residuals Phosphorus Mass (87.3% removal)	kg/yr	24,800	25,000	25,400	26,800	27,100
Effluent Phosphorus Mass (12.7% remains)	kg/yr	3,600	3,600	3,700	3,900	3,900
Effluent Phosphorus Concentration (4.22x10^9 L/yr)	mg/L	0.85	0.86	0.88	0.92	0.93
Current Phosphorus Discharge Limits	mg/L	1				
Future Phosphorus Limits	mg/L	0.075				
Increase of Phosphorus Removed	kg/yr	0	200	600	2,000	2,300
	lb/yr	0	441	1,320	4,410	5,070
Chemical Costs to Remove Increased Phosphorus	$/yr: $0.53/lb Fe x 2.2 lb Fe/lb P removed	$0	$514	$1,540	$5,140	$5,910

1. See Table 12.5 for municipal wastewater flows and initial dosages.
2. Chemical costs were previously calculated by the wastewater treatment facility in Table 12.3.
3. These calculations assume that an orthophosphate product would be used where there was no polyphosphate fraction. If a poly/ortho ratio of 50/50 product were used, the phosphate mass contributed from the drinking water would double.

WASTEWATER TREATMENT FACILITY ASSOCIATED WITH WATER SYSTEM C

For Water System C, the wastewater phosphorus assessment results are shown in Tables 12.7 to 12.10. The drinking water phosphate chemical is about 3% of the total phosphorus load to the wastewater treatment plant. An increase to 3.5 mg/L as PO_4 in the drinking water would increase the phosphorus contribution to 36% using the current phosphate product.

If the current product is changed to one with no polyphosphate fraction, the phosphorus contribution would be 19% at the maximum dose of 3.5 mg/L as PO_4. This can be seen by comparing Tables 12.9 and 12.10. Another advantage of using an orthophosphate only product is that the wastewater effluent phosphorus concentration would not be pushed over the discharge limit. The effluent concentration would be 0.71 mg/L as P with the current poly/orthophosphate blend product; it would be 0.56 mg/L as P with an orthophosphate product. If the discharge limit is 0.66 mg/L as P, this would be a significant difference. A 100% orthophosphate product would also lower annual costs of phosphorus removal because there would be less total phosphorus in the water. At a dose of 3.5 mg/L as PO4 in the drinking water, additional chemical costs would drop from $89,700 with the current product to $32,400 with an orthophosphate product.

Table 12.7
Total phosphorus loadings for wastewater treatment facility associated with Water System C

Item Measured	Units	Average over 2013, 2014, 2015
Influent Flow	l/yr	29,300,000,000
Influent Phosphorus Mass	kg/yr	79,800
Effluent Flow	l/yr	29,300,000,000
Effluent Phosphorus Mass	kg/yr	13,700
Residuals Phosphorus Mass	kg/yr	66,200
Phosphorus Removal	%	83

WASTEWATER TREATMENT FACILITY ASSOCIATED WITH WATER SYSTEM B

For Water System B, the addition of phosphate to the drinking water would not push the wastewater discharge phosphorus concentration close to the limit as was estimated for Water System C. The addition would, however, impact annual costs and sludge handling. A phosphorus assessment for Water System B is seen in Tables 12.11 to 12.13.

WASTEWATER TREATMENT FACILITY ASSOCIATED WITH WATER SYSTEMS F AND G

Water Systems F and G are campus water systems. The water system, the buildings, and the wastewater treatment plant are owned by the same entity on each campus. Both water systems land-spread the wastewater and there are no phosphorus constraints in doing so. One land-spreading operation is adjacent to a stream. Even without constraints, the manager is concerned about phosphorus runoff to the stream.

Table 12.8
Municipal phosphorus loadings for wastewater treatment facility associated with Water System C

Item Measured	Units	Average over 2013, 2014, 2015	Source of Information
Influent Flow	l/yr	29,300,000,000	See Table 12.7
Inflow and Infiltration	l/yr	13,800,000,000	There are building perimeter drains tied to the sewer system.
Flow from Water System C	l/yr	15,500,000,000	WPSC: drinking water flows Assumption: 10% of municipal flow is used for landscaping and cooling and does not enter the treatment plant per manager
Phosphorus Dose from Water System C	mg/L as P	0.16	Dose is 0.13 to 0.2 mg/L as PO_4 using a product with 40% of phosphorus as orthophosphate and 60% as polyphosphate
Influent Phosphorus Load	kg/yr	79,800	See Table 12.7
Phosphorus Load from Water System C	kg/yr	2,500	Flow x Dose x 10^(-6)
Phosphorus Load from Other Sources	kg/yr	77,300	Subtraction of municipal load from influent load
Municipal Phosphorus Load	% of influent phosphorus load	3.1	

WPSC= Wisconsin Public Service Commission; drinking water utilities submit annual reports on operations parameters and costs where flows to distribution systems were obtained for 2013, 2014, 2015

Table 12.9
Municipal phosphorus loadings for wastewater treatment facility associated with Water System C with increased drinking water phosphate dosages using a poly/orthophosphate blend product

Item Measured	Units	Current Phosphorus Dosing	1 mg/L as PO_4	3 mg/L as PO_4	3.5 mg/L as PO_4
Water System C Phosphorus Load	kg/yr	2,500	12,700	38,000	44,400
Other Phosphorus Sources	kg/yr	77,300	77,300	77,300	77,300
Total Influent Phosphorus Load	kg/yr	79,800	90,000	115,000	122,000
Municipal Phosphorus Load	% of influent phosphorus load	3.1	14	33	36
Residuals Phosphorus Mass (82.8% removal)	kg/yr	66,100	74,500	95,200	101,000
Effluent Phosphorus Mass (17.2% remains)	kg/yr	13,700	15,500	19,800	21,000
Effluent Phosphorus Concentration (29.3x10^9 L/yr)	mg/L	0.47	0.53	0.68	0.71
Current and Future Discharge Limit	mg/L as P	assume 0.66 similar to WWTF for A, I, and J			
Increase of Phosphorus Removed	kg/yr	0	8,400	29,100	34,900
	lb/yr	0	18,500	64,200	76,900
Chemical Costs to Remove Increased Phosphorus	\$/yr: \$0.53/lb Fe x 2.2 lb Fe/lb P removed	\$0	\$21,600	\$74,900	\$89,700

1. See Table 12.5 for municipal wastewater flows and initial dosages.
2. Chemical costs were previously calculated by the wastewater treatment facility in Table 12.3.
3. These calculations assume that the current phosphate product with poly/orthophosphate ratio of 60/40 will continue to be used.

Table 12.10
Municipal phosphorus loadings for wastewater treatment facility associated with Water System C with increased drinking water phosphate dosages using an orthophosphate product

Item Measured	Units	Current Phosphorus Dosing	1 mg/L as PO_4	3 mg/L as PO_4	3.5 mg/L as PO_4
Water System C Phosphorus Load	kg/yr	2,500	5,070	15,200	17,700
Other Phosphorus Sources	kg/yr	77,300	77,300	77,300	77,300
Total Influent Phosphorus Load	kg/yr	79,800	82,300	92,500	95,000
Municipal Phosphorus Load	% of influent phosphorus load	3.1	6.1	16	19
Residuals Phosphorus Mass (82.8% removal)	kg/yr	66,100	68,200	76,600	78,700
Effluent Phosphorus Mass (17.2% remains)	kg/yr	13,700	14,200	15,900	16,400
Effluent Phosphorus Concentration (29.3x10^9 L/yr)	mg/L	0.47	0.48	0.54	0.56
Current and Future Discharge Limit	mg/L as P	assume 0.66 similar to WWTF for A, I, and J			
Increase of Phosphorus Removed	kg/yr	0	2,100	10,500	12,600
	lb/yr	0	4,630	23,100	27,800
Chemical Costs to Remove Increased Phosphorus	\$/yr: \$0.53/lb Fe x 2.2 lb Fe/lb P removed	\$0	\$5,400	\$27,000	\$32,400

1. See Table 12.5 for municipal wastewater flows and initial dosages.
2. Chemical costs were previously calculated by the wastewater treatment facility in Table 12.3.
3. These calculations assume that 100% orthophosphate is used.

Table 12.11
Total phosphorus loadings for wastewater treatment facility associated with Water System B

Item Measured	Units	Average over 2013, 2014, 2015
Influent Flow	l/yr	38,100,000,000
Influent Phosphorus Mass	kg/yr	179,000
Effluent Flow	l/yr	42,400,000,000
Effluent Phosphorus Mass	kg/yr	14,700
Residuals Phosphorus Mass	kg/yr	165,000
Phosphorus Removal	%	92

Table 12.12
Municipal phosphorus loadings for wastewater treatment facility associated with Water System B

Item Measured	Units	Average over 2013, 2014, 2015	Source of Information
Influent Flow	l/yr	38,100,000,000	See Table 12.4
Flow from Water System B	l/yr	22,700,000,000	WPSC: drinking water flows Assumption: 10% of municipal flow is used for landscaping and cooling and does not enter the treatment plant similar to Water System C assumption
Phosphorus Dose from Water System B	mg/L as P	0	No phosphate dosing
Influent Phosphorus Load	kg/yr	179,000	See Table 12.4
Phosphorus Load from Water System B	kg/yr	0	Flow x Dose x 10^(-6)
Phosphorus Load from Other Sources	kg/yr	179,000	Subtraction of municipal load from influent load
Municipal Phosphorus Load	% of influent phosphorus load	0	

WPSC= Wisconsin Public Service Commission; drinking water utilities submit annual reports on operations parameters and costs where flows to distribution systems were obtained for 2013, 2014, 2015

Table 12.13
Municipal phosphorus loadings for wastewater treatment facility associated with Water System B with increased drinking water phosphate dosages

Item Measured	Units		Current Phosphorus Dosing	1 mg/L as PO_4	3 mg/L as PO_4	3.5 mg/L as PO_4
Water System B Phosphorus Load	kg/yr		0	6,680	20,000	23,400
Other Phosphorus Sources	kg/yr		179,000	179,000	179,000	179,000
Total Influent Phosphorus Load	kg/yr		179,000	186,000	199,000	202,000
Municipal Phosphorus Load	% of influent phosphorus load		0	3.6	10	11.5
Residuals Phosphorus Mass (91.9% removal)	kg/yr		165,000	171,000	183,000	186,000
Effluent Phosphorus Mass (17.2% remains)	kg/yr		14,000	15,000	16,200	16,500
Effluent Phosphorus Concentration (42.4x10^9 L/yr)	mg/L		0.35	0.36	0.38	0.39
Current and Future Discharge Limit	mg/L as P		assume 0.66 similar to WWTF for A, I, and J			
Increase of Phosphorus Removed	kg/yr		0	6,220	18,500	21,600
	lb/yr		0	13,700	40,800	47,600
Chemical Costs to Remove Increased Phosphorus	$/yr: $0.53/lb Fe x 2.2 lb Fe/lb P removed		$0	$16,000	$47,600	$55,400

1. See Table 12.12 for municipal wastewater flows and initial dosages.
2. Chemical costs were previously calculated by the wastewater treatment facility in Table 12.3.
3. These calculations assume that 100% orthophosphate is used.

SUMMARY OF DRINKING WATER PHOSPHATE DOSING EFFECTS ON ASSOCIATED WASTEWATER TREATMENT FACILITIES

The impact that drinking water phosphate addition has on associated wastewater treatment facilities varies with many factors as demonstrated in this chapter – the drinking water pumpage versus the wastewater influent flow, the efficiency of the wastewater treatment facility's phosphorus removal, and the stringency of the phosphate discharge limit. A phosphorus assessment from the drinking water system through the wastewater treatment facility, similar to the one in this chapter, can be performed for individual water systems.

However, the cost analysis in this chapter only included the additional chemical costs needed to remove additional phosphorus from wastewater. More detailed costs of phosphorus removal can be calculated at the individual wastewater treatment facility to include increased tank volume installation costs, both for wastewater treatment tanks and sludge handling tanks, and additional annual costs of labor, energy, chemical usage, sludge storage, sludge processing, and sludge disposal. The costs could be studied over a set time period such as 30 years and a proper engineering economics calculation performed to establish a present worth cost of phosphorus removal to current and future limits. This present worth can be weighed against the present worth of lead and copper control strategies in the drinking water system.

It should be noted that using a phosphate-based corrosion control product with polyphosphate in it increases the total phosphorus loading to the wastewater treatment facility above the loading required to satisfy drinking water regulations. The additional phosphate from the polyphosphate fraction increases the cost of wastewater treatment plant phosphorus removal.

Phosphate-dosing is often miscommunicated because of confusion over units of measurement. Drinking water personnel often refer to dosing in terms of orthophosphate concentration in units of mg/L as PO4 while wastewater personnel refer to the total phosphorus concentration in units of mg/L as P. Specifically, wastewater agencies follow EPA method 365.1, Revision 2.0: Determination of Phosphorus by Semi-Automated Colorimetry (EPA 1993), for running samples of wastewater, surface water, and industrial waste.

Total phosphorus and orthophosphate concentrations must be converted to one unit or another for comparison, where mg/L as P is about one-third the concentration expressed as PO4. Also, only the orthophosphate fraction of the phosphorus addition into drinking water is typically measured and stated. The total phosphorus added into the drinking water must be stated with the inclusion of both the orthophosphate and the polyphosphate fractions.

In addition to tangible costs, the impact of the phosphorus discharged to the environment must be assessed. In the wastewater treatment facility calculations in this chapter, it was assumed that a percentage of the municipal flow does not enter the wastewater treatment facility; the remaining phosphorus-laden water is released directly into nature – mainly in the form of landscaping water and industrial non-contact cooling water discharge.

Non-contact cooling water is either discharged to a natural body of water through a pipe or it is allowed to infiltrate into the ground, especially in rural settings. The phosphorus discharge limits have created a dilemma for industries using non-contact cooling water as cooling water treatment may be required in the future. In some instances, industry is trying to negotiate sending all non-contact cooling water discharge to the wastewater treatment facilities to avoid costly upgrades, thus exacerbating the stress of removing phosphorus at the wastewater treatment facilities.

To assess the impact of a phosphorus discharge outside of a wastewater treatment facility and directly to a natural body of water, it is difficult to find appropriate indices of environmental and community impacts. In this case, the state regulatory agencies have already established such an index. That is, the phosphorus discharge limit set by state regulatory agency for the natural body of water that receives the wastewater, landscaping run-off, and industrial non-contact cooling water is a statement of environmental and community impacts; it is based on the sensitivity of the receiving body of water to additional phosphorus and the intended community use of the natural body of water.

The phosphorus assessment in this chapter provides the realization that lead and copper corrosion control strategies have impacts outside of the water system itself. This chapter provides a framework within which to calculate not only the environmental costs of phosphorus addition to drinking water, but to shed light on the socio-economic costs associated with removal and regulatory compliance.

The reality is that a drinking water utility is typically a separate agency from its receiving wastewater utility, both acting independently and unaware of the negative effects of their actions on their counterpart. The resultant outcome may unintentionally punish the rate-payers, who are customers of both agencies. This reinforces how crucial communications and joint research projects are between water and wastewater utilities.

CHAPTER 13
CONCLUSIONS

This project explored if lead or copper orthophosphate and carbonate compounds could continue to provide corrosion control in the presence of the various chemical and microbiological interactions actually occurring in water systems. A long list of water quality parameters was studied in relation to lead and copper release measured in special distribution system monitoring stations located in eight water systems. The stations allowed measurements in each system to be taken under similar conditions so that data could be compared over time and between systems. The conclusions from studying the parameters are organized into three general categories of factors that have been observed to shape water quality:

1. Uniform corrosion factors
2. Biostability factors
3. Chemical scale formation and dissolution factors

Conclusions continue in this section with various observations made from comprehensively studying the water systems.

UNIFORM CORROSION

The Lead and Copper Rule puts emphasis on uniform corrosion based on carbonate compound solubility as the reason that lead and copper are released into water. Two water quality factors, pH and alkalinity, are identified in the Rule as the controlling factors of lead and copper release in using this model. (Alkalinity is one expression of the carbonate concentration.)

In this project, eight water systems were evaluated for pH and alkalinity as well as many other water quality parameters, including routine lead and copper release data. No correlations were found between dissolved lead and copper release and pH and alkalinity (Chapter 7 and Appendix A). No correlations were found between the dissolved inorganic carbonate concentrations in the water and dissolved lead and copper release (Figures 7.4 and 7.6). Nor were correlations found between dissolved lead and copper release and the carbonate solubility models' predicted dissolved lead and copper release (Figures 7.3 and 7.5).

Insight as to why no patterns were seen between uniform corrosion parameters and actual lead and copper release comes from the chemical and microbiological analyses of the scales that formed on the metal plates in the monitoring station test chambers over the monitoring period (Tables 6.9, 6.10, 7.16, 7.17, 9.4, 9.5, 10.19, 10.20). There was not just one lead or copper carbonate compound found on the plates as idealized by the carbonate solubility models. Instead, there were mixtures of types of lead or copper carbonate compounds as well as lead or copper oxides. There were also other elements, such as iron, manganese, aluminum, phosphorus, and sulfur. In addition, there were thermodynamically unstable amorphous compounds observed on the plates, not just thermodynamically stable crystalline compounds assumed by the equilibrium-based carbonate solubility models. There were also chemical scales observed containing lead and copper that had the potential to crumble into the water and transport lead or copper as particulate matter, an aspect not considered in the carbonate solubility models. (From Chapter 6, it can be seen that particulate lead and particulate copper potentially can be quite a significant fraction of the total metals that can reach consumers.)

To add to this chemical complexity, there was the presence of a microbiological component in the metal surface accumulations (Chapter 9). Biofilms were quantified in the scales as well with data pertaining to degree of biofilm formation and degree that microorganisms were held in the biofilm versus in the water (Tables 9.4 and 9.5).

Given the lack of correlations to lead and copper release and the complex nature of the metal surface accumulations observed, the models of lead and copper carbonate solubility used by the Lead and Copper Rule to predict lead and copper release do not adequately represent the set of circumstances actually found in drinking water distribution systems.

This is not to say that lead and copper carbonate solubility concept should not be considered. Instead, this is an observation that carbonate solubility is only one of many factors that control the release of lead and copper in actual water distribution systems. The major water quality parameters of the carbonate concept, alkalinity and pH, must always be considered in an evaluation of lead and copper control along with two other groups of water quality parameters identified on the metal plates – parameters related to chemical scale formation and biostability of the water.

It is possible that each of these three general categories of lead and copper release factors (uniform corrosion, chemical scale formation, and biostability) may take on more or less significance in different time periods in a water system. For example, Figure 13.1 shows a typical lead release pattern from lead plates in a test chamber of a PRS Monitoring Station. When the clean metal plates are first put in contact with the system water in the test chambers, there is initially high metal release with a steep drop over time. This is most likely a time period when oxide and carbonate scales are developing on the metal surfaces by means of uniform corrosion mechanisms. Other chemical scales and biofilms are most likely forming but at a lower rate, making uniform corrosion the more significant factor in lead and copper release at that time.

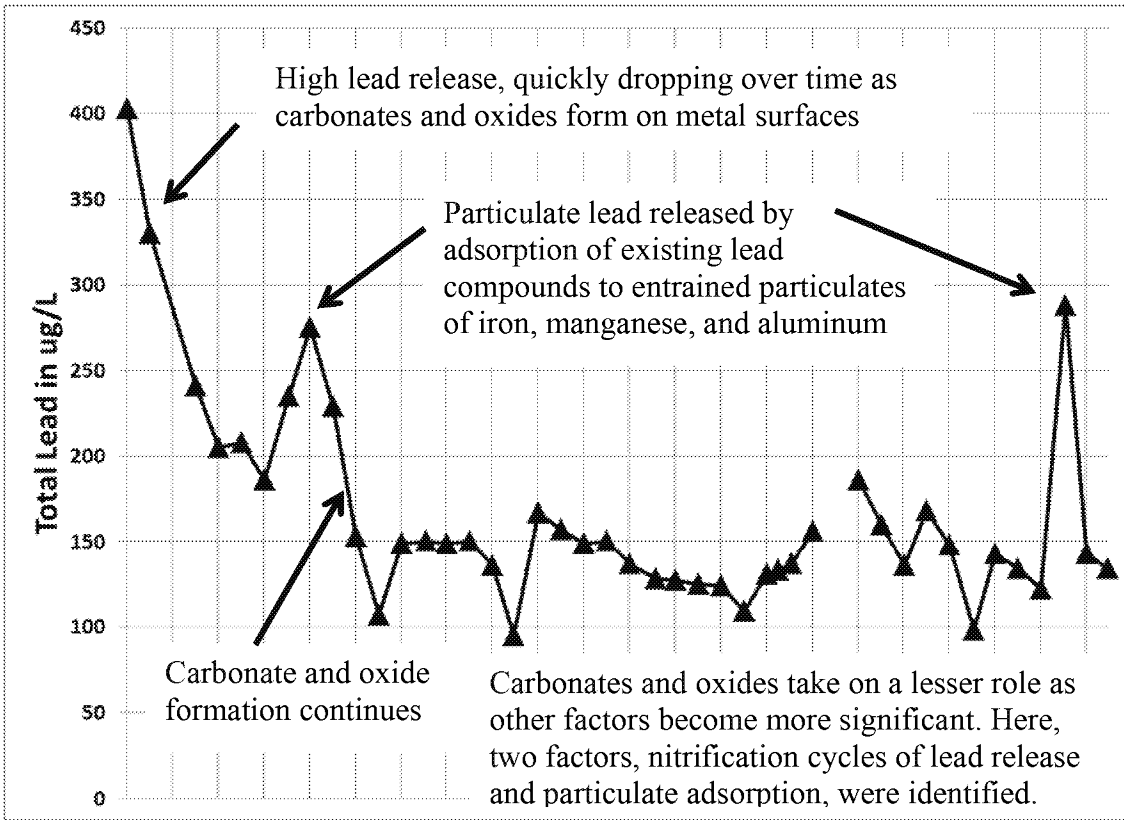


Figure 13.1 Example of lead release pattern over time from stagnating water in a lead test chamber

In Figure 13.1, during the period of carbonate and oxide formation, water main flushing occurred nearby sending iron, aluminum, and manganese particulates into the test chambers and creating an increase in released particulate lead, theoretically, by adsorption of lead carbonates and oxides to the entrained metal particulates. Therefore, a second significant factor of lead release, that is, adsorption of lead compounds by chemical scales, appears to have come into play in determining the total lead concentration in the water in addition to the uniform corrosion factor during that time period. The carbonate and oxide formation probably continued past that point as shown by a continued decrease in total lead concentration. Then, lead release fluctuated around a lower concentration range. Possible factors identified in this time period for release of lead were microbiological nitrification cycles and episodes of metal scale release from the water system. Therefore, no factor can be ignored in that it may take on more significance in release of lead and copper during other time periods.

Another aspect of the carbonate solubility models for uniform corrosion is that they ignore other compounds that can also control the uniform corrosion of metals. Oxides of lead and copper have already been mentioned as being present on the metal plates in this project (Tables 6.9 and 6.10 and Chapter 7). It is known that some oxides have lower solubility than other oxides (Lytle and Schock 2005). The ones with lower solubility provide better corrosion control. Those oxides form in a more oxidizing environment. To that end, oxidation/reduction potential was measured. In this project, oxidation/reduction potential did not show an inverse relationship with lead and copper release. However, two water systems were found to have traces of a highly insoluble lead oxide in their lead plate scales. Even though lead and copper oxide formation was not significant in this study, it must not be neglected when comprehensively studying lead and copper release into drinking water as every water system has its own combination of factors shaping its water quality.

Uniform corrosion by means of chloride and sulfate was explored in this project because of the high solubility of lead and copper chloride and sulfate compounds compared to the solubility of carbonates and oxides. Trends with the Larson-Skold Index, an index where the concentrations of chloride and sulfate are divided by the alkalinity were explored. A high index implies higher corrosion of lead and copper and higher dissolved lead and copper concentrations in the water. However, relationships found between the Larson-Skold Index and lead/copper were confounded with system operations factors in this project. This will be discussed under the section, "Development of Hypotheses and Conclusions from Water Quality Monitoring Data," in this chapter. The Chloride to Sulfate Mass Ratio, another index, was shown to be related to dissolved lead and copper release by means of an exponential function, staying relatively non-influential over a wide range of lead and copper concentrations and increasing in influence with the highest concentrations (Figures 7.12 and 7.14). This is possibly a statement on the higher solubility of chloride compounds versus sulfate compounds and, in this project, is not related to galvanic corrosion as it has been related in the literature (Nguyen et al. 2010; Nguyen et al. 2011). There were also no direct correlations identified between lead and copper release and chloride and sulfate concentrations in this project. Nevertheless, chloride and sulfate must not be neglected when comprehensively studying lead and copper release into drinking water as every water system has its own combination of factors shaping its water quality.

BIOSTABILITY

Biostability of water is the balance of factors that encourage the growth of microorganisms versus factors that discourage their growth. Factors that encourage their growth are nutrients (compounds of nitrogen, organic carbon, and phosphorus), long residence time, and low disinfection. These factors can be counteracted with limiting nutrients, lowering residence time/water age, and increasing disinfection.

The water systems studied in this project showed direct correlations of dissolved and/or particulate lead and copper release with biostability parameters and microbiological populations (Table 6.11, Table 6.12, Appendix A, and Chapter 9). For example, in Water Systems A and B dissolved lead release trended with nitrification patterns – a peak of ammonia release in the water system followed by a peak of organic carbon release with microbiological population increase. In addition, the nitrification pattern included a continuous increase in nitrite/nitrate concentration over warm weather months that trended with release of particulate lead and copper as well as dissolved copper into the autumn. But, nitrification was not the only microbiological activity seen in the water systems. Appendix A and Tables 6.11 and 6.12 show dissolved lead and dissolved copper release trending with microbiological population in most of the water systems. In some water systems, dissolved organic carbon appeared to dominate as a co-trending factor and in other water systems, ammonia, nitrate, and/or phosphorus appeared to dominate. In addition, all eight water systems had biofilms form on the test chamber metal plates and experienced increased microbiological populations in the test chambers (Tables 9.1 through 9.6). So, this project's data show that microorganisms and their biofilms were present in the test chambers and they were interrelated with lead and copper release.

But, the correlations of lead and copper release to biostability parameters and presence of an excessive population of microorganisms (> 500 microorganisms per mL per 40 CFR Part 141 Subpart H [Code of Federal Regulations 2010a]) do not prove that microbiologically influenced corrosion occurred. That was out of the scope of this project. In the scope was to explore the trending of lead and copper release with biostability parameters and microbiological populations. It can be theorized that microbiologically influenced corrosion was possible in these situations.

It is known that microorganisms can secrete acidic enzymes to attach to metal surfaces (Bremer et al. 2001) and that such localized acidity can corrode metal surfaces. With the prevalence of biofilms formed in the test chambers (Tables 9.1 through 9.6), corrosion from the surface acidity could have been possible.

It is also known that microorganisms can produce acidic waste products, such as hydrogen sulfide from sulfate-reducing bacteria, which forms a weak acid in water (Rittman and McCarty 2001; Madigan and Martinko 2006), another pathway to increased metal corrosion. Acidic waste products were not measured in this project. However, sulfur was found in the chemical scales of Water System B's metal plates. The analyst theorized that this could have been a remnant from sulfate-reducing bacteria. An independent biostability study of Water System B found sulfate-reducing bacteria to be a significant presence in pipe biofilm in the system.

Nitrifying microorganisms produce nitrates that can form highly soluble compounds of lead and copper and can possibly re-solubilize existing lead and copper films on metals surfaces. The production of nitrates within the nitrification process was measured in Water Systems A and B along with changes to lead and copper release in both dissolved and particulate forms. Study Water Systems A and B sparklines in Appendix A to see the trends.

Some microorganisms produce acetate (a form of dissolved organic carbon) which can also form soluble lead and copper compounds. This project's data showed a role that dissolved organic carbon played in the nitrification process. Water Systems A and B showed a peak of dissolved organic carbon occurring a few weeks after a peak of ammonia. Dissolved lead appeared to increase during the ammonia and carbon peaks. Dissolved copper began to increase as the dissolved lead and organic carbon diminished. As stated previously, in Water System B, an independent study of biostability was performed. It was found that the water has a tendency to form biofilms with microorganisms identified that produce nitrates and acetates (organic carbon). This matched the patterns measured at the PRS Monitoring Station where nitrate and organic carbon concentrations were related to dissolved lead and copper release.

It is also known that there are iron-oxidizing bacteria that use electrons from iron and other metals as their food source (Rittman and McCarty 2001; Madigan and Martinko 2006), yet another pathway by which metal can be oxidized by microorganisms in a water system. This was not observed in the PRS Monitoring Stations, but Water System F joined the project because of an epidemic of pinhole leaks in copper pipes. The initial investigation of the system and its remediation outside of this monitoring project studied microbiological populations and concentrations of nutrients in the water. Well and water main rehabilitation produced water that was improved in biostability. Pinhole leaks are no longer an issue in the water system. Pinholes created by microbiologically influenced corrosion are the result of bacteria utilizing electrons from adjacent metal for their metabolic pathways.

It can be theorized that these or other similar pathways are occurring in the presence of growing populations of microorganisms as found in the test chambers, especially when lead and copper release has been seen trending with microbiological nutrients, wastes, and populations.

From the above list of possible microbiological pathways that can affect metals corrosion, it can also be theorized that microbiological life cycles can produce both particulate metals and dissolved metals. Particulate metals can occur when electrons are utilized by microorganisms directly from metals, as described for iron-oxidizing bacteria, and oxidized metals in the form of solids are produced. Particulate metals can also result if biofilms experience a die-off in a changing water environment. With biofilms intertwined with chemical scales as observed on the metal plates, chemical scales can be broken up or metals adsorbed to biofilm material can be released to the water.

Dissolved metals can occur when acidic waste products are released into the water, lowering the general water pH. They can also occur when waste products, such as nitrates or acetates can form soluble compounds with lead or copper and can contribute to the uniform corrosion electrochemistry or re-solubilize lead and copper from previously formed uniform corrosion by-products.

Both dissolved and particulate lead and copper release were observed in this project in relation to microbiological populations and nutrients. Refer to Tables 6.11 and 6.12 and Appendix A.

The concept of biostability also leads to the realization that microbiologically influenced corrosion is systemic in a distribution system. A colony of microorganisms in a biofilm may be localized but microbiological nutrients, microbiological waste products, and microorganisms themselves can be measured throughout a distribution system. For example, from Chapter 9, it is seen that the biostability parameters of ammonia, nitrite/nitrate, dissolved organic carbon, microbiological population, and disinfection concentration were measured at a high water age location of the water systems. In this way, the potential for microbiological life cycles with resultant metals corrosion pervades a distribution system.

CHEMICAL SCALE FORMATION AND DISSOLUTION

A variety of metals were tracked along with lead and copper release. Particulate metals often appeared together in the system water as did dissolved metals. Particulate metals often released together in the stagnating water of the test chambers as did dissolved metals. Lead and copper followed the trends of other metals. In this project, it was difficult to discern if metals in the system water influent to the test chambers caused the release of lead and copper in the test chambers or if lead and copper release was a response to other conditions that caused the other metals to release as well. Nevertheless, Tables 6.11 and 6.12 and Appendix A show that particulate lead and copper release was typically accompanied by the presence of particulate iron, manganese, and/or aluminum.

In addition, various metals were intertwined in the scales on the surfaces of the test chamber metal plates (Tables 10.19 and 10.20). This implies that one cannot assume that carbonate or orthophosphate scale protective against corrosion will be deposited uniformly on metal surfaces. Instead, it can be assumed that such scales will be deposited on and within complex pipe wall accumulations.

DIFFERENTIATION OF TOTAL LEAD AND COPPER INTO DISSOLVED AND PARTICULATE FORMS

Besides observations in the three general categories of factors that can affect lead and copper release, several additional aspects of lead and copper release in a water distribution system were demonstrated by this study. First of all, lead and copper must be studied by differentiating dissolved lead and copper from particulate lead and copper. Each form of the metals is influenced by different factors and can only be controlled by knowing those factors. Refer to Tables 6.11 and 6.12 to view the various factors that co-trended with each form of lead and copper.

DEVELOPMENT OF HYPOTHESES AND CONCLUSIONS FROM WATER QUALITY MONITORING DATA

One must be very careful in drawing conclusions regarding cause and effect. The Spearman rank correlations and sparkline time series graphs used in this study only show that two parameters are trending together or trending in opposite directions. No causality should be assumed but only used in hypotheses for further empirical testing. Predictions of future water system behavior based on the hypotheses must match measured observations of outcomes, otherwise theories must be changed. This is empirical science; it is a common industrial process control technique (Wheeler and Chambers 1992).

One must also be careful in interpreting the reason that a water quality parameter might be influencing lead and copper release. There are many water quality parameters that can play a role in more than one category of lead and copper release factors. ORP, total phosphorus, pH, nitrate, and alkalinity, for example, can all be involved in purely chemical interactions or can be involved in microbiological mechanisms. For example, dissolved copper trended inversely with pH in Water System A. This could mean that a higher pH suppressed copper release as theorized in the carbonate solubility model in a chemical role. But, pH change was found to be occurring in context of a microbiological nitrification process. Dissolved lead increased in concentration during the same time. It was more likely that dissolved copper release and dissolved lead release were influenced by multiple nitrification factors and not solely a function of pH as idealized in the carbonate solubility model.

In addition, a water quality parameter might be the outcome of a water system operational change. For example, in Water System D, dissolved lead trended inversely with alkalinity. However, alkalinity was representative of which water source was entering the PRS Monitoring Station. One water source had high dissolved organic carbon and high polyphosphate concentrations while the alternate source had higher alkalinity but lower dissolved organic carbon and polyphosphate concentrations. Direct trends between dissolved lead and dissolved organic carbon and polyphosphate concentrations were seen. It cannot be said necessarily that it was the high alkalinity that caused the lower dissolved lead release.

On a final note, deceptive relationships can be uncovered in correlating water quality parameters. In Water System A, alum dosing, used as a coagulant in source water treatment, expressed itself as an increase in sulfate concentration in the distribution system water. But, instead of dissolved lead, it was particulate lead release that trended with the Larson-Skold Index, a sulfate and chloride-based index. This was unexpected and theoretically occurred because increased turbidity and particulate iron concentrations trended with increased particulate lead release at the same time. The trend between particulate lead release and turbidity/particulate iron follow the current understanding that particulate iron and other particulate metals represented by turbidity can adsorb and transport lead. See Figure 13.2 for a schematic of the events described in this example. In another case, water softening added chloride to the water. Dissolved lead release trended oppositely to the Larson-Skold Index instead of with the Index as was expected. It appeared that newly installed clean water softeners were acting as a barrier to system water contaminants, especially regarding factors that lower the biostability of the water, resulting in decreased dissolved lead release. See Figure 13.3 for a schematic of events in that water system. In both of these cases, the lead release appears to have been influenced by other factors and not necessarily the chloride and sulfate concentrations or the Larson-Skold Index.

These examples show that care must be taken in formulating conclusions merely from common assumptions regarding the role of specific water quality parameters.

REGULATORY COMPLIANCE DILEMMAS

Another aspect demonstrated by this project was that Lead and Copper Rule compliance does not necessarily represent a water system free of significant lead and copper release. Residential profile sampling in Chapter 3 showed the possibility of higher lead and copper levels after the first one liter sample even in water systems dosing orthophosphate. Water Systems E, F, G, H, and C demonstrated the potential for discrete random metals releases which may or may not be captured in the Lead and Copper Rule compliance sampling. Water System F had never been out of compliance with the Lead and Copper Rule and yet experienced a system-wide epidemic of pinhole leaks in copper pipes with the potential for high particulate lead and copper release. Water System G had experienced a great number of customer complaints of discolored water over the years but would not have been out of compliance with the Lead and Copper Rule for lead if it were not for erroneously including three non-representative sampling sites in the compliance sampling pool.

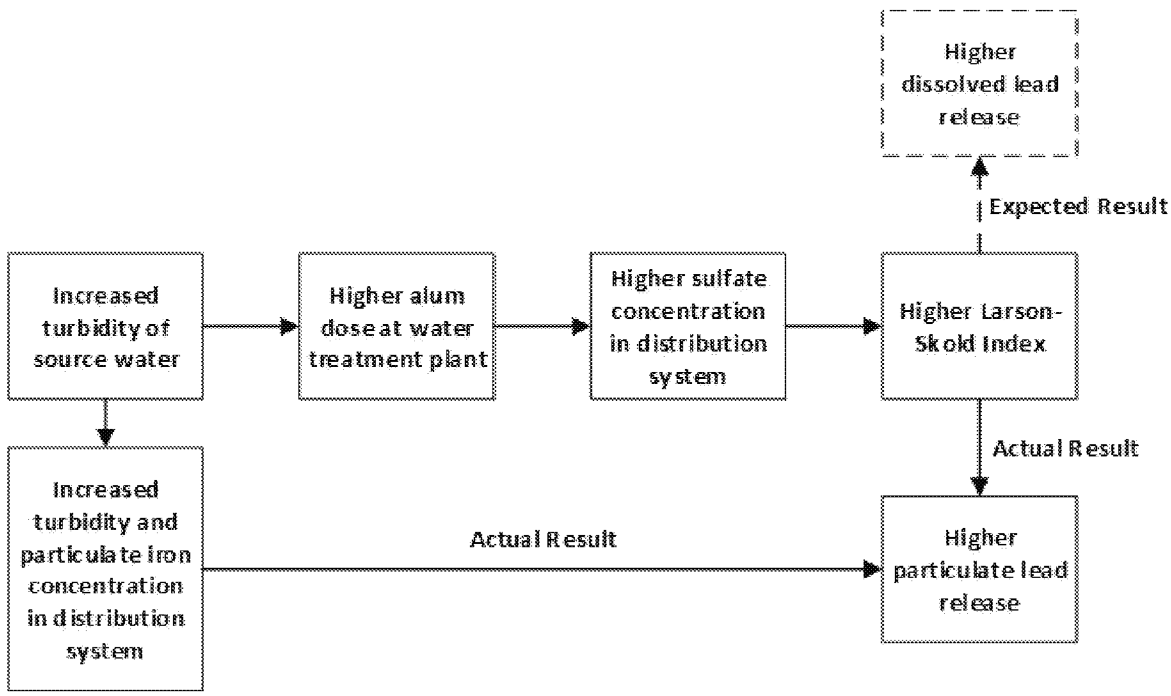


Figure 13.2 Water System A events involving sulfate and the Larson-Skold Index

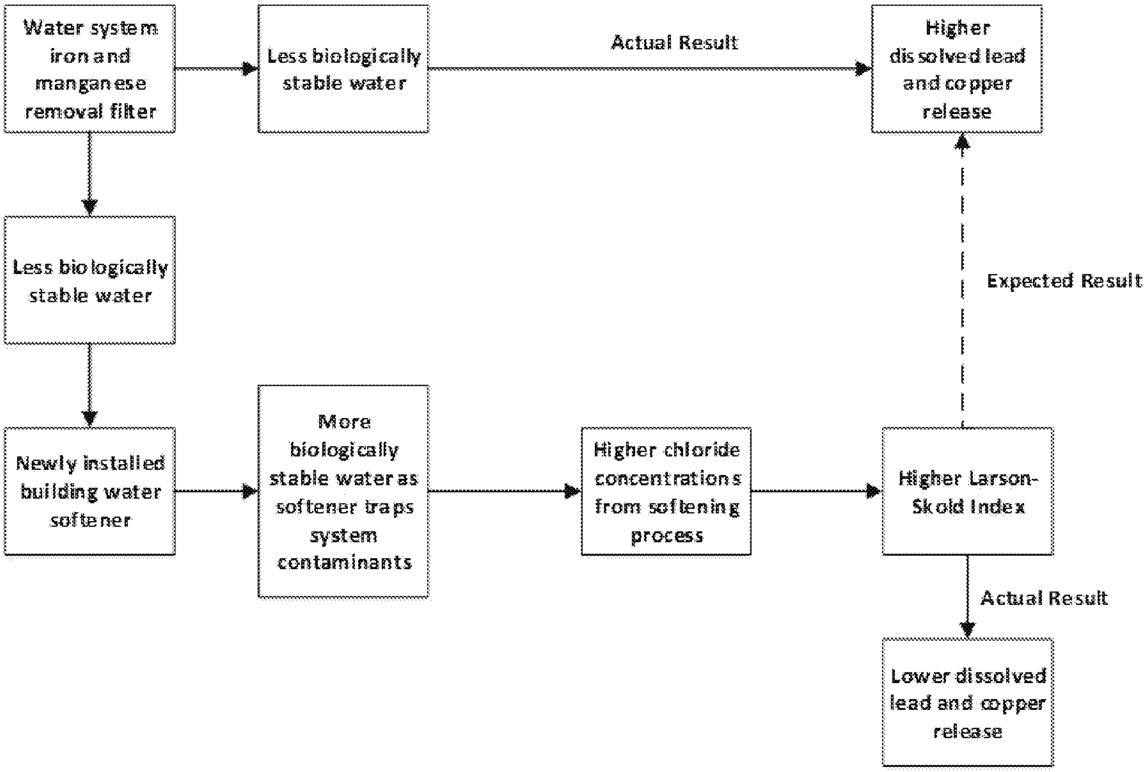


Figure 13.3 Water System E events involving chloride and the Larson-Skold Index

SURROGATE MONITORING FOR LEAD AND COPPER RELEASE

The monitoring data in this project identified three field tests that were good surrogates for tracking the potential for lead and copper release in a water system. However, they are not excellent surrogates because the lower precision of the field tests may have rendered the data less sensitive to correlation with other water quality parameters. In general, it can be said that oxidation/reduction potential (ORP) increases as disinfection concentration, an oxidant, is increased. Increased disinfection concentration has the potential to limit microbial growth and often is seen trending oppositely to microbial growth in the monitoring data. Therefore, ORP and disinfection concentration as monitored parameters can indicate the ability to control the growth of microorganisms and to prevent biofilm formation in a water system, thereby lowering the potential for corrosion of metals through microbiological life cycle pathways.

In the water quality parameter correlation study, turbidity was sometimes representative of particulate metals in the water, sometimes representative of microorganisms in the water, and sometimes not correlative to other water quality parameters at all. Turbidity cannot be claimed to definitively represent particulate lead, particulate copper, or microbiological population. Perhaps the common light scattering analysis of turbidity is not sensitive enough to make these correlations. Investigation of newer turbidity technology techniques, such as laser techniques, as a more sensitive water quality indicator should be performed.

However, if turbidity is high, it is by definition a measure of particulate matter in the water. The particulate matter can either come from source water particulates or pipe wall accumulations. It is reasonable to assume that turbidity represents:

- Possible entrainment of lead and copper-adsorbing metal particulates (iron, manganese, and aluminum)
- Possible entrainment of lead and copper particulates
- Possible entrainment of microbiological materials – microorganisms and biofilm materials

In Chapter 4 and Chapter 11, it was demonstrated how graphs of disinfection concentration and turbidity over time at routinely-visited monitoring sites, such as the Total Coliform Rule distribution system compliance sampling sites, can pinpoint locations and time periods with potentially degraded water quality, that is, lower disinfection concentrations and higher turbidities, than other sites and time periods. This can lead to an assessment of specific operational events in order to improve those water quality parameters and lower the potential for water quality issues. In this project, graphs of disinfection concentration and of turbidity displayed patterns of nitrification in two chloraminated systems, Water Systems A and I. They also showed results of high velocity flushing of water mains in Water System B. Therefore, these indicators of water system cleanliness and biostability – disinfection concentration, ORP, and turbidity – can be an economical means of tracking the water quality status in a water system, including the possible release of lead and copper.

THE EFFECTS OF DISTRIBUTION SYSTEM CLEANING

This study occurred over cleaning and rehabilitation activities carried out by many of the water systems. The timing of rehabilitation efforts and installation of the monitoring station did not always coordinate. In addition, some plans for cleaning efforts could not be carried out. Project schedules and budgets ended before efforts were completed. Nevertheless, each water system experienced its own insights and successes. These are summarized in Table 11.20. In general, removal of chemical scales and biofilms from pipe walls and efforts to improve the biostability of the water resulted in lowered lead and copper releases as seen in PRS Monitoring Station test chamber data and Lead and Copper Rule compliance sampling data. Several of the water systems had not completed all of the initial efforts required to bring the system into overall control but were heading in that direction. After legacy scales and biofilms can be cleaned from a water system, routine maintenance for cleaning and biostability is required. This is "water system hygiene" that must be a continuing part of water system operations.

All water systems were in compliance with the Lead and Copper Rule by the end of the monitoring phase of this project with two exceptions. Water System B lead and Water System D copper 90th percentile concentrations were just above the Action Levels but predicted to move below the Action Level by the next sampling round after additional efforts. Water System B did subsequently achieve Lead and Copper Rule compliance with a 90th percentile lead concentration of 12 µg/L. Water System D was in the process of lowering the polyphosphate levels and continuing to clean water mains and maintain organic carbon removal at the new treatment plant in order to further lower copper levels. Water System D achieved Lead and Copper Rule compliance for copper in October 2017. With all the participating water systems continuing the water system hygiene activities as part of routine operations, improvements to lower lead and copper release continue in those systems.

PRS Monitoring Station test chamber data continued to show spikes of particulate lead or copper release even at the end of this monitoring project, but were typically reduced in magnitude and/or occurrence. One must keep in mind that the test chambers did not undergo the scouring that the system piping did. This was intentional because it was desired to eventually study scale composition on the test chamber metal plate surfaces. The slower damping out of particulate metal releases in the test chamber versus the actual pipes was expected.

Each water system defined lead and copper release trends and associated those trends with other water quality parameters and system operations as working theories of metals release. Focus on these trends is now ongoing in daily operations and not only being addressed every three years as is done with Lead and Copper Rule compliance.

Each water system is now focused on small changes in lead and copper release and routinely working on improvements instead of being triggered by the Action Levels of the Lead and Copper Rule in order to make improvements.

As each water system makes improvements for lowering lead and copper release, they also lower their potential for other water quality issues such as Total Coliform Rule and Disinfection By-Products Rule compliance as well as secondary water quality standards such as iron and manganese release by removing materials from the water systems associated with these regulatory compliance issues.

THE ROLE OF ORTHOPHOSPHATE IN CORROSION CONTROL OF METALS

The theory behind orthophosphate's effectiveness at corrosion control is based on its ability to inhibit the release of dissolved lead from piping material. But, what effect does the orthophosphate have on suppressing release of lead particulates from existing pipe wall scales? What effect does orthophosphate have on suppressing release of dissolved lead in the presence of high chloride, nitrate, or acetate concentrations? What effect does orthophosphate have on the same aspects with copper piping and copper release? These questions have not been definitively answered in this study. However, with the monitoring data from this study, these various factors are now called into question and suspected of interfering with the idealized function of orthophosphate in inhibiting uniform corrosion of metal.

With this study of the effect of orthophosphate on controlling lead and copper release in actual water systems, there was no clear picture that the chemical renders a water system safe from lead release to consumers. Both Water System A and Water System I, using the relatively higher doses of orthophosphate in comparison to the other systems, had residences with lead levels above the 15 μg/L Action Level of the Lead and Copper Rule found during profile sampling. In Water System A, the higher lead reaching the consumer's tap was in particulate form and not the dissolved form that orthophosphate has been found to address. However, it cannot be known in this study if orthophosphate dampened the release of particulate lead or not.

There were also no common trends that tied orthophosphate dosage to the lowering of lead or copper release in the five phosphate-dosing water systems that also operated a distribution system monitoring station.

With the higher dosing water systems that also operated a distribution system monitoring station (Water Systems A, D, and H), lead and copper release differed greatly in average concentration and in variation of concentrations. Water System A had the lowest lead and copper release of the three water systems. It was the one system that had a very low polyphosphate concentration in its corrosion control product. However, there were other differences as well that confound the ability to draw conclusions: Water System A is a surface water system using chloramine disinfection with one distribution system entry point delivering water undergoing a constant treatment process where water characteristics are able to be kept within a narrow range. Water Systems D and H, using a higher concentration of polyphosphate, are groundwater systems using chlorine disinfection with multiple distribution system entry points delivering water with characteristics more variable as delivered by a well at any point in time. With all these factors, it cannot be claimed that orthophosphate was definitively responsible for the lower lead and copper release in Water System A.

The study of the scales formed on monitoring station test chamber metal plates brought up other questions about the effectiveness of phosphate-dosing. Plates from four of the water systems that used a phosphate-based corrosion control chemical were studied. Water System A exhibited the formation of the desired protective lead phosphate compound as the most prominent peak in the x-ray diffraction analysis (Table 8.6). Nevertheless, the water had the propensity to release the same quantity of particulate lead as it did dissolved lead, where dissolved lead is controlled by orthophosphate. Water System C had a presence of the desired protective lead phosphate compound at one-third the most dominant x-ray diffraction peak. However, the focus of Water System C's propensity to release lead was on the high particulate release of lead and not its low dissolved lead release. Water Systems D and H showed no presence of the desired protective lead phosphate in their metal plate scales.

Besides looking for phosphate minerals on the plates, the element, phosphorus, was measured. Phosphorus was found at almost 10% by weight in Water System A's lead scales and almost 5% by weight in the copper scales. In Water System C, the phosphorus was found at almost 1% but not found in the copper scales. A significant presence of phosphorus was found in Water System D's lead and copper scales but was found to be bound into an amorphous carbon and iron-laden mass. No significant phosphorus was found on the lead and copper scales of Water System H.

In addition, all scales that were studied showed that other metals, such as iron, manganese, and aluminum, can be a significant presence in the scales as well.

These observations lead to the theory that orthophosphate is not necessarily able to form a uniform barrier over lead or copper surfaces in mature water systems. Instead, it is woven into a web of scales with many other metals and biofilms and many times is not adequately present even when regulatory-approved corrosion control dosing is occurring.

This does not mean that orthophosphate is not a viable tool for corrosion control. It should always be considered in the comprehensive approach to corrosion control but placed within proper context. It should never be assumed that its use is applicable to all water systems. It should never be assumed that its use provides a guaranteed protection from exposure to lead or copper for consumers.

POLYPHOSPHATE VERSUS ORTHOPHOSPHATE

As described in Chapter 1, drinking water systems have a long history of phosphate-based chemical usage. The original products were polyphosphates known for their ability to hold (sequester) metals in water. They were used for pulling solid calcium, iron, and manganese accumulations from well components, water filters, water main walls, and plumbing fixtures and holding them in the water to be flushed out of the water system or consumed.

In addition, some polyphosphate applications were for iron and, later, lead corrosion control. Early on, it was not realized that polyphosphate could break into orthophosphate ions. It was not realized that orthophosphate ions could form insoluble compounds with metals that would possibly create corrosion-inhibiting barriers on metal surfaces. Instead, it was thought that polyphosphate molecules could provide corrosion inhibition itself. Confusion arose as some testing scenarios with polyphosphate successfully lowered metals concentrations in water and other scenarios increased the metals concentrations, most likely dependent on the degree of polyphosphate reversion to orthophosphate. Refer to Chapter 1.

The confusion continues to current times even after reports of the inadequacy of polyphosphate to inhibit corrosion and why (Holm and Schock 1991; AwwaRF and DVGW 1996; Cantor et al. 2000; EPA 2016a). These reports also warn of the possibility of polyphosphates increasing lead and copper concentrations in the water, pulling lead and copper compounds into the water and holding them there just like calcium, iron, and manganese compounds. Many water systems continue to use a polyphosphate/orthophosphate blended product as a corrosion control agent. In this project, polyphosphate fractions ranged from 10 to 100% (Table 8.1). For Water Systems C, D, and G in this project, total phosphorus trended with dissolved lead and copper release. These data may reflect a relationship between polyphosphate's sequestering abilities, or it may be related to sloughing of phosphorus-laden chemical scales or biofilm material from pipe walls.

As another consideration, when polyphosphates are incorporated in corrosion control chemicals, the orthophosphate concentration is a fraction of the total phosphorus concentration. The orthophosphate fraction may be providing metals corrosion control. The polyphosphate fraction may be inert or may be holding metals in solution, but it is not providing metals corrosion control. This means that the polyphosphate has increased the total phosphorus loading to the wastewater treatment facility and the environment without providing the drinking water system the benefit of lead or copper corrosion control. Refer to Chapter 12.

THE ENVIRONMENTAL IMPACT OF PHOSPHATE CHEMICALS

Details of the effect of total phosphorus on wastewater treatment facilities and the environment were explored in Chapter 12. This exercise of calculating the impact of phosphate-based corrosion control chemicals on associated wastewater treatment plants emphasized that lead and copper corrosion control strategies have impacts outside of the water system itself.

The impact that drinking water phosphate addition has on associated wastewater treatment facilities varies with many factors – the drinking water pumpage versus the wastewater influent flow, the efficiency of the wastewater treatment facility's phosphorus removal, and the stringency of the phosphate discharge limit.

A cost analysis should include more than the additional chemical costs needed to remove additional phosphorus from wastewater as was performed in Chapter 12. More detailed costs of phosphorus removal can be calculated at the individual wastewater treatment facility to include increased tank volume installation costs, both for wastewater treatment tanks and sludge handling tanks, and additional annual costs of labor, energy, chemical usage, sludge storage, sludge processing, and sludge disposal. The costs could be studied over a set time period such as 30 years and a proper engineering economics calculation performed to establish a present worth cost of phosphorus removal to current and future limits. This present worth can be weighed against the present worth of lead and copper control strategies in the drinking water system.

As mentioned previously, it should be noted that using a phosphate-based corrosion control product with polyphosphate in it, increases the phosphorus loading to the wastewater treatment facility above the loading required to satisfy drinking water regulations.

In addition to tangible costs, the impact of the additional phosphorus discharged to the environment can be assessed for an individual location. Typically, it is difficult to find appropriate indices of environmental and community impacts. In this case, the state regulatory agencies have already established such an index. That is, the phosphorus discharge limit set by state regulatory agency for the natural body of water that receives the wastewater, the landscaping run-off, and the industrial non-contact cooling water is a statement of environmental and community impacts; it is based on the sensitivity of the body of water to additional phosphorus and the intended community use of the water.

COMPARISON BETWEEN THE LEAD AND COPPER RULE PERSPECTIVE AND THE COMPREHENSIVE PERSPECTIVE OF LEAD AND COPPER CORROSION CONTROL

The Lead and Copper Rule focuses on pH/alkalinity adjustment and orthophosphate addition for control of lead and copper corrosion. According to the current EPA guidance manual (EPA 2016a) for lead and copper control, Water Systems A, B, and C should raise the pH or add orthophosphate for corrosion control. But, even Water System A with a seemingly appropriate dose of orthophosphate could not prevent particulate lead from reaching consumers. Raising the pH of the water for Water System A, would aid the effectiveness of the chloramine disinfection (Connell 1996) but possibly take the water system out of the most effective range for orthophosphate addition. In addition, an increase in pH in Water Systems B and C could render free chlorine disinfection less effective (Connell 1996). Both systems may have been experiencing some forms of microbiologically influenced corrosion and raising the pH would not be helpful in fighting microbiological growth.

For the groundwater systems in this study, the EPA guidance advises them to add blended phosphates or remove iron and manganese and add orthophosphate. This would ignore the issue of microbiologically influenced corrosion that actually occurred in the wells of the water systems of this project and was attributed to the production of iron and manganese. In addition, the water systems except for E and F had been adding blended phosphates and problems were increasing. Water System G specifically increased the blended phosphate dosing several times in order to comply with the Lead and Copper Rule to no avail because the issues in the wells were overlooked. Water Systems C, D, and G were found to have increasing dissolved lead and copper release with increasing phosphorus possibly because of the polyphosphate fraction in the corrosion control products.

This project has used a more comprehensive strategy than the idealized perspective upon which the Lead and Copper Rule is based to understand the nuances of individual water systems. The comprehensive perspective describes water entering distribution system piping as a very complex solution of naturally-occurring chemicals and microorganisms as well as added treatment chemicals. Drinking water comes to the system from nature where it has been in contact with soil, rocks, and air. Chemicals from those media dissolve into the water or become entrained as particulate matter. Microorganisms, which are everywhere in our environment, are also transferred to the water along with nutrients for their growth. Water treatment, when performed, does not necessarily remove all of the chemical and microbiological components in the water and additional chemicals may also be added for treatment.

When inside of distribution system piping – not only the water mains, but also the service lines and the premise plumbing – water is subjected to even more complexity. There are various accumulations of chemical scales and biofilms that have built up over years with which the water comes in contact. Coming out of the piping is drinking water that has been transformed by its interaction with the pipe wall debris. This is the process by which distribution system water quality is shaped. See Figure 13.4.

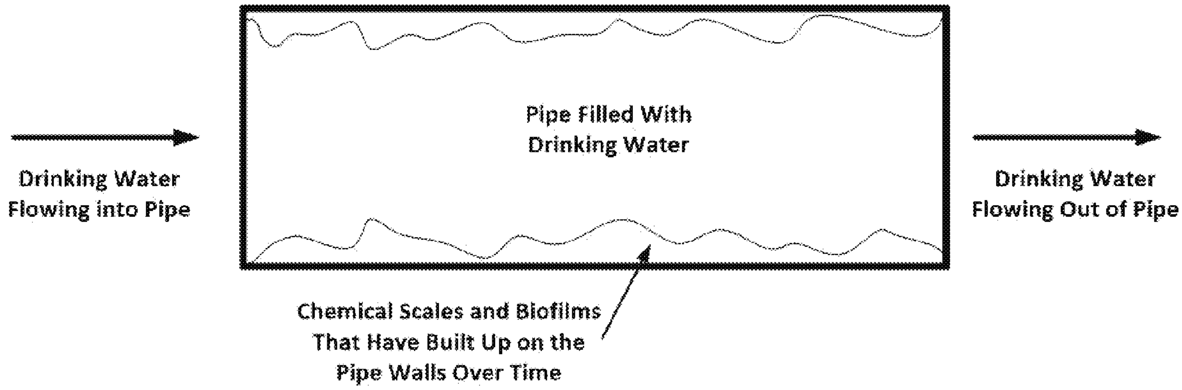
Figure 13.5 shows the many combinations of interactions that can occur inside the piping – chemistry in water, microbiology in water, chemistry in pipe wall accumulations, microbiology in pipe wall accumulations, chemistry between the water and the pipe wall accumulations, microbiological interactions between water and pipe wall accumulations, chemical and microbiological interactions in water, chemical and microbiological interactions in pipe wall accumulations, chemical and microbiological interactions between water and pipe wall accumulations. Physical disturbances in the system, such as water velocity, pressure gradients, and vibrations can also add to this complexity. The point is that there are no scientific formulae that can describe this complexity; the final water quality cannot be predicted.

The final water quality can include quite a number of disagreeable and harmful qualities, some of which are addressed by primary and secondary drinking water regulations – discolored water, water with odor, release of lead or copper, release of iron or manganese or other metals, presence of pathogenic microorganisms (*E. coli, Legionella*), formation of disinfection by-products – and some which are not addressed, such as excessive growth of non-pathogenic microorganisms. Refer to Figure 13.4.

The point of this comprehensive perspective is that all of the water quality outcomes – both good and bad – are all related. They are manifestations of the same phenomena, the interactions of the complex solution of water coming in contact with the complex pipe wall accumulations of chemical scales and biofilms.

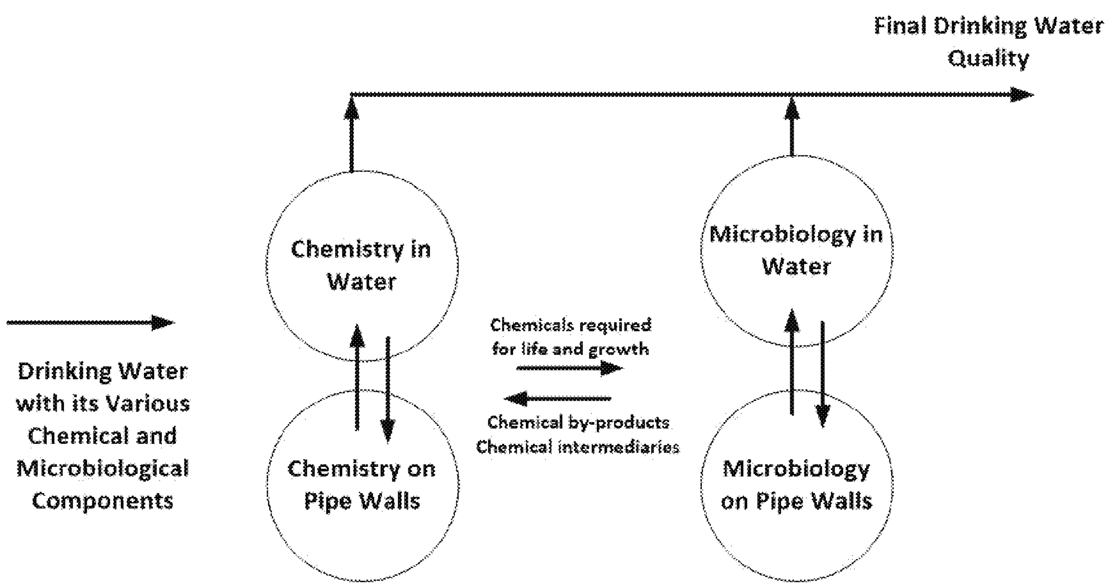
In the comprehensive perspective, the remedy for bad water quality, including lead and copper release, is to physically remove the pipe wall accumulations as would be practicable. In addition, the water must be controlled to prevent excessive growth of all microorganisms (not just pathogenic ones) and their biofilm formation. That is, the water must be made "biologically stable."

The drinking water regulations for distribution system water quality issues treat each issue separately. For the Lead and Copper Rule, the water solution entering the pipe is a solution of carbonate ions (Figure 13.6). The pipe wall accumulations are hypothesized as only containing carbonates of lead or copper – no other chemicals or microorganisms. The quantity of lead or copper dissolved in the water is dependent on the solubility of the lead or copper carbonate compounds formed. The more soluble the compound, the more lead or copper is dissolved in the water. From the regulatory perspective, lead and copper control is a matter of finessing the pH and/or alkalinity of the water to produce a more insoluble compound of lead and copper carbonates. Alternatively, orthophosphate can be added to form highly insoluble compounds of lead and copper phosphates. Substitute the word, orthophosphate in Figure 13.6 for the word, carbonate.

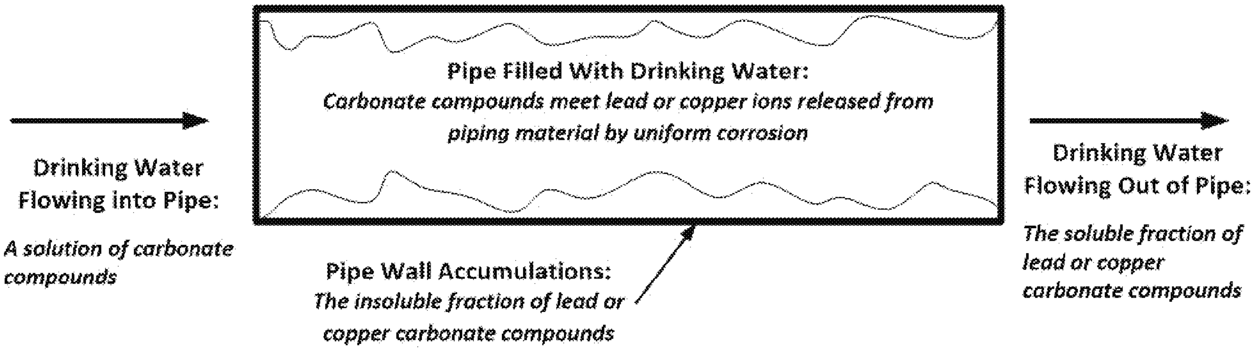


Pipe influent drinking water composition:
compounds of organic carbon, nitrogen, phosphorus, carbonate, hydroxide, hydrogen, oxygen, carbon dioxide, sulfate, chloride, iron, manganese, and many other metals and microorganisms, etc.
Water inside pipe: See Figure 13.5
Pipe wall accumulations:
chemical scales of a variety of solids (including carbonates, oxides, iron, manganese, aluminum, phosphorus, sulfur) and biofilms
Pipe discharge possible drinking water quality characteristics:
lead, copper, iron, and other metal release in both dissolved and particulate form; discolored water; water with odor; presence of pathogenic microorganisms like E. Coli and Legionella; excessive growth of non-pathogenic microorganisms; formation of disinfection by-products, etc.

Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 13.4 The comprehensive perspective of lead and copper release and overall distribution system water quality



Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 13.5 The complexity of the water and pipe wall accumulation interactions



Compare this figure to Figure 13.4.

Source: Courtesy of Process Research Solutions, LLC of Madison, WI.
Figure 13.6 The regulatory perspective of lead and copper release

The comprehensive perspective was developed over many years of experience in investigating water distribution systems. Just after the Lead and Copper Rule was passed, conflicts arose between aspects of the Rule with observations and data gathered from actual water systems (Verburg 2016; Cantor et al. 2000). Issues regarding the transport of lead by existing pipe wall scale arose in investigations after that (Cantor 2006; Schock et al. 2014). Then came investigations that glimpsed into the reality of microbiological participation in shaping the distribution system water quality (Cantor et al. 2003b; Cantor et al. 2006). These experiences led to the development of tools to study a comprehensive list of water quality parameters, to obtain information from the distribution system in a consistent and comparable way, and to understand what the data were implying (Cantor et al. 2000; Cantor et al. 2003a; Cantor 2008; Cantor 2009; Cantor and Cantor 2009; Cantor 2010; Cantor 2011; Cantor et al. 2012). The tools enabled the gathering of more data where more nuances of distribution system water quality could be uncovered. In 2014, a presentation (Cantor 2014) comparing actual distribution system data to Lead and Copper Rule predictions of lead and copper release summarized these experiences.

There is confirmation of many aspects of the comprehensive perspective in the literature. The Lead and Copper Rule and its uniform corrosion model only include dissolved lead and copper release and not particulate lead and copper. But, chemical scales have been acknowledged as a complexity that shapes lead and copper release in the distribution system (Schock et al. 2014; EPA 2016a). Chemical scales, such as iron, manganese, and aluminum, can adsorb lead and copper, accumulate them, and release them as significant particulate concentrations when the coarse scales crumble. Existing chemical scales also can prevent the lead or copper carbonate, oxide, or phosphate solids from forming a uniform, non-porous barrier on pipe walls (DeSantis and Schock 2014). Nevertheless, the finessing of pH and alkalinity or the addition of orthophosphate continues to be the first step as Lead and Copper Rule guidance (EPA 2016a), ignoring the acknowledged interference of chemical scales.

Oxides of lead have been acknowledged and the presence of a more insoluble form of lead oxide has been acknowledged as contributing to lead control in water systems (Lytle and Schock 2005). Chlorides and sulfates have been acknowledged as creating more soluble lead and copper compounds, helping to perpetuate the corrosion of the pipe walls (Larson and Skold 1958; Nguyen et al. 2010; Nguyen et al. 2011).

The role of microorganisms in shaping the water quality continues to be a topic of misunderstanding. The viewpoint of many drinking water researchers and practitioners appears to assume that corrosion occurs first as caused solely by chemical factors and this creates debris where the microorganisms take up residence. This is exemplified in a study of biostability where corrosion rate was studied as a factor contributing to the formation of biofilms instead of formation of biofilms contributing to the corrosion rate; causality was not proven, it was assumed (LeChevallier et al. 2015). In an article on iron pipe corrosion, "a diverse microbiological community (sic) can be found in the scale" is stated (Burlingame et al. 2006). The article describes the complete corrosion process as chemical only with the corrosion debris merely providing a structure to which microorganisms attach. Both of these articles imply an assumption that microorganisms have no role in the corrosion process. Practitioners in other fields have a broader understanding of microbiologically influenced corrosion and the complex ways that a "consortia" of microorganisms in biofilms can interact (Peabody 2001).

Other common misunderstandings about microbiologically influenced corrosion have been addressed in the "Biostability" section of this chapter. In summary, this project has demonstrated that:

- Microbiologically influenced corrosion is the outcome of many pathways of microbiological life cycles including formation of acidic biofilms, production of acidic waste products, production of waste products that form highly soluble compounds with existing lead and copper compounds on pipe walls, and use of electrons from metals as a food source by metals-oxidizing bacteria.
- Microbiologically influenced corrosion is a systemic issue in a water system and not necessarily a localized issue because microbiological nutrients, waste products, and microorganisms themselves can be measured throughout a water system.
- Microbiologically influenced corrosion can produce both particulate and dissolved lead and copper release because of the various life cycle pathways that can either release insoluble oxidized metals or can re-solubilize existing solid metal compounds.

ORTHOPHOSPHATE ADDITION OR PH ADJUSTMENT VERSUS WATER SYSTEM HYGIENE

Orthophosphate addition and pH/alkalinity adjustment as dictated by the Lead and Copper Rule are relatively straightforward to install and operate. Water system hygiene – cleaning of infrastructure and achieving biostability of water – as a means of lead and copper corrosion control is an involved process. This section considers if this more complicated route should be taken.

First, this study demonstrated that orthophosphate and pH/alkalinity adjustment are not necessarily providing the protection that is assumed. This has been summarized previously in this chapter.

But, there appears to be many successful applications of pH/alkalinity adjustment and of orthophosphate dosing in lowering lead and copper concentrations in water systems around the United States. This could be for any of several reasons, as demonstrated in this project:

- The pH/alkalinity adjustment or orthophosphate dosing is effective in specific water systems.
- Or, the influencing water quality parameters can play a role in both chemical and microbiological interactions and the true reason that adjustment of the specific water

quality parameters is effective for lowering lead and copper release has not been identified.

- Or, other water system operations, such as carrying out a high velocity flushing program or reduction in system residence time or better elimination of nutrients or filter cleaning, are occurring simultaneously to the presumed corrosion control strategy and are actually the real influencing factors on corrosion control.
- Or, follow up sampling of the outcome of the corrosion control strategy is inadequate and not representative of the actual effectiveness.

In summary, it is difficult to uncover the true influencing factors on lead and copper release. A comprehensive list of water quality parameters must be tracked and they must cover at least the three general categories of metals corrosion influencing factors: uniform corrosion by several types of chemistries, biostability of water, and formation and dissolution of chemical scales. It is an ongoing empirical process of testing hypotheses to determine lead and copper release controlling factors. If there has not been a comprehensive approach performed, there is no proof that the pH/alkalinity adjustment or orthophosphate dosing is the actual controlling factor. The other factors and inter-relationships have not been ruled out. Refer to the section, "Development of Hypotheses and Conclusions from Water Quality Monitoring Data," in this chapter for examples of how assumptions of cause and effect might not be justified.

There is concern that the time it takes to clean a water system and achieve biologically stable water is too long a time for consumers to wait for protection from lead and copper release. However, this project demonstrated that maximum concentrations of lead and copper and the frequency of release can be controlled at least over one cleaning season and even more progress can be made within the time frame that the Lead and Copper Rule lays out for the installation of corrosion control. The Lead and Copper Rule uses the time frame of five years, listed in Table 13.1, to move from a compliance exceedance to confirmed protection.

Table 13.1
Lead and Copper Rule time frame for compliance

Action	Time Frame in Months
A water system conducts regulatory Lead and Copper Rule monitoring and exceeds the Action Level for lead or copper	
Complete a corrosion control study	18
Regulators designate optimized corrosion control from study	6
Corrosion control technique is installed	24
Follow-up monitoring for two consecutive six-month periods	12
Total time to confirmation of protections against lead and copper release	60 months = 5 years

Water System K achieved compliance within one year of exceeding the lead action level by means of high velocity flushing, manganese control before the entry point, and actions toward biostability in maintenance of wells. It has been ten years and the water system has continually improved so that the 90th percentile concentration for lead is currently around 5 μg/L.

After two seasons of high velocity flushing, Water System B had greatly lower maximum lead concentrations and a 90th percentile concentration hovering around the Action Level but lower than before flushing as shown in Table 13.2.

Table 13.2
Water System B Lead and Copper Rule lead data in μg/L

Sampling Year – Period	90th Percentile Concentration	Maximum Concentration
2012-1	27	490
2016-1	15	53
2016-2	18	38
2017-1	12	41

Water System B also performed a biostability study and pinpointed the epicenter of the system's sudden change to bio-instability – the installation of a second large water transmission line that added days of residence time to the water. By the end of the fourth cleaning season since non-compliance, they will have progressed farther as can be seen in Table 13.2 for the sampling period, 2017-1. Water Systems D, E, F, G, and H, all have similar stories of progress made in one cleaning season and on their way to even lower lead and copper release.

The comprehensive approach of achieving a clean water system and biologically stable water is also a pro-active approach that can and should be instituted into water system routine operations even without a Lead and Copper Rule exceedance. It lowers the potential for any of the water distribution water quality issues to occur, not just lead and copper release.

This water system hygiene activity is an approach with which pH/alkalinity adjustment or orthophosphate addition can be performed simultaneously as a situation might require. In a water system practicing system hygiene, any intended passivating scale formation could more uniformly develop on metal surfaces and be more effective without the interference of the other scales and biofilms.

SUMMARY

This report challenged common understandings of lead and copper corrosion control. However, it does not advise discarding the traditional understandings and use of pH and alkalinity adjustments or orthophosphate dosing. Instead, these are to be used as tools in a much larger tool box. They must always be considered in a comprehensive approach to lead and copper control and water quality improvement.

These findings do suggest that one should not initially define a water system as corrosive to lead or copper based solely on pH and alkalinity. The carbonate solubility model cannot be used as an indicator of water corrosivity. This project has demonstrated that the idealized models for lead and copper release do not adequately represent the set of circumstances actually found in drinking water distribution systems. A water system must be evaluated comprehensively in order to theorize the most likely factors influencing dissolved lead, particulate lead, dissolved copper, and particulate copper release.

These findings also suggest that dosing of orthophosphate is not guaranteed to protect consumers from lead and copper release. Consumer protection can only be assessed with a comprehensive investigation as demonstrated in this study.

Water quality is shaped by the cleanliness of the water pipes and the biostability of the water in mature water systems. Water systems need to adopt a standard of practice of removing accumulations of chemical scales and biofilms from pipe walls routinely and a standard of practice of routinely tracking and improving the biostability of the water through water system components. The basis of water quality control, including lead and copper control, should be this new focus on water system hygiene.

CHAPTER 14
RECOMMENDATIONS

The Lead and Copper Rule is relatively straightforward to carry out. The comprehensive perspective of water quality is not. How can practitioners who have a multitude of water system operational demands and budget constraints control lead and copper release by applying the comprehensive perspective? The following is a list of recommendations:

ROUTINELY IMPROVE INFRASTRUCTURE

Recommendations listed here for infrastructure improvement are standard activities in drinking water systems. Historically, however, many of these activities have been relegated to the bottom of the annual budget because of other pressing needs. This report points out that it is the state of the infrastructure that is shaping the water quality in the system. Putting infrastructure improvement first can replace the need for corrosion control chemical addition and its perpetual annual costs and more comprehensively address the influencing factors on metals release in a water system.

Develop a Plan to Remove Lead and Galvanized Iron Service Lines

Discussion regarding a new version of the Lead and Copper Rule has emphasized removing lead from water systems, specifically the remaining lead service lines (EPA 2016b). This should be a top priority for water systems.

However, there are water systems out of compliance with the Lead and Copper Rule that do not have lead service lines. So, removal of lines is an important step but it should not exempt a water system from taking the other steps listed here.

In addition, galvanized iron piping has also been found to either aid in holding and transporting lead or in contributing lead to the water directly (McFadden et al. 2011). If service lines are made of galvanized iron pipe, they also should be removed.

Develop a Water Main Replacement Program

Some water mains have too large a quantity of accumulations to clean or are prone to breakage and should be replaced. Most water system operations include a list of water mains requiring replacement.

Develop and Carry out Routine Uni-Directional Flushing of Water Mains

High velocity flushing programs should be prepared, preferably using a hydraulic model of the water system. Flushing should be performed for each flushing run until the turbidity of the water is brought down to <1 NTU so that contaminants are less likely to remain entrained in the water when released from pipe wall accumulations. Turbidity before and after each flushing run should be recorded as well as recording the time to reach the final turbidity. Data such as these items aid in optimizing flushing efforts for the next flushing season.

Use Chemical Cleaning Aids, When Applicable, and Use Them Cautiously

Chemical cleaning aids, such as a biofilm-removing chemical like the Clearitas® product that was used in four water systems in this project, can be used in on-line continuous dosing but with caution in order to prevent too fast a release of existing pipe wall debris. Chemicals should be used initially at low doses to keep the release of pipe wall debris manageable. Frequent flushing of water system components should be performed along with the chemical addition. Monitoring of turbidity in the system being cleaned should be performed frequently to gauge the degree that pipe wall debris is released. The dosage can be increased slowly as long as there are no water quality disruptions from fast pipe wall release.

The cleaning chemicals help to soften pipe wall debris for faster removal. Typically, scouring is also required to completely remove pipe wall debris especially biofilms. Scouring can come from high-velocity turbulent water flow, from rough objects pushed through the pipeline (pigging), or from other methods of creating abrasive action along the pipe wall.

Clean Other Water System Components

Other water systems components, such as tanks, reservoirs, and filters, must also be cleaned at a routine interval, especially when biostability parameter monitoring indicates a cleaning is necessary. These components can typically be taken off-line and cleaned with high concentrations of cleaning chemicals, such as the Clearitas® product used in this project, and scouring.

ADOPT AN ONGOING BIOSTABILITY IMPROVEMENT PROGRAM

To achieve biostability in a water system, nutrients in the water (organic carbon, ammonia, nitrite/nitrate, total phosphorus) must be controlled, residence time of water in the system must be minimized, and disinfection must be adequately dosed into the water. Water system components – such as source water, wells, large transmission lines, water treatment filters, and storage tanks – can become incubators of microorganisms and producers of microbiological nutrients and waste products that subsequently can corrode metals throughout a water system. An understanding of how the microbiological world is intertwined with the chemical world must be adopted for water system operation.

Perform biostability tracking and improvement in source water, wells, filters, storage tanks, and critical distribution system sites as water quality parameters for lead and copper control. Parameters to evaluate are active disinfection, ammonia nitrogen, nitrite, nitrate, total phosphorus, and dissolved organic carbon concentrations. Additionally, the ATP analysis should be used routinely to track the microbiological populations. The ATP analysis measures all microorganisms present (except viruses) and gives a more comprehensive measurement than older tests, such as the heterotrophic plate count measuring only heterotrophic bacteria, did. The complete microbiological population, not just the pathogens, must be acknowledged as playing a role in shaping water quality.

Drinking water system standards of practice should include the understanding that microbiological populations in flowing and stagnating water should be under 500 microbial equivalents per milliliter. More importance should be placed on keeping dissolved organic carbon levels below 0.5 mg/L, a typical limit of detection in laboratories. Nitrification can occur in water systems, even those not adding chloramines, and should be controlled as was seen in Water System B. Other sources of nitrogen, organic carbon, and phosphorus compounds must be controlled.

Source water should be re-evaluated using the biostability parameters. More stringent treatment goals may be necessary in order to prevent biologically unstable water from entering a distribution system.

The biostability concept is especially important to monitor around water treatment filters. Filters host a high residence time for water to the advantage of microbiological growth. Filter media with its high surface area is excellent for biofilm attachment. If filters become biologically unstable, they can inoculate the downstream water system with high microbiological populations, nutrients, and waste products.

For groundwater systems, drinking water system standards of practice should be more stringent on the routine biostability testing of wells, routine cleaning to keep metals and biostability parameters in check, and more comprehensive inspections when cleaning does not solve identified issues.

Water storage tanks and large capacity pipelines should be included in a biostability monitoring program. Residence time in these structures is a major consideration in achieving biologically stable water.

MAINTAIN AN ONGOING CORROSION CONTROL STUDY

Water systems are directed to prepare a corrosion control study when the Action Levels for lead or copper have been exceeded. It is best to keep ongoing documentation to determine the status of water quality over time and to investigate issues at the time that they arise.

Change the Perspective and Directives of the Lead and Copper Rule

This study has shown that the Lead and Copper Rule directives for lead and copper control are too simplistic. The Lead and Copper Rule should start water systems first on a path toward cleanliness and biostability and then make an ultimate decision as to whether orthophosphate or pH/alkalinity adjustment is required or not. If a water system is out of compliance with the Lead and Copper Rule, much progress can be made using existing data, more involved distribution system monitoring, and performing initial cleaning efforts within of Lead and Copper Rule time frames for achieving compliance. If a water system is not out of compliance with the Lead and Copper Rule, the path toward cleanliness and biostability should nevertheless be started and continued as a proactive measure to maintain and improve water quality.

The directives regarding lead and copper release dependent on pH and alkalinity need to be re-evaluated. There are too many aspects missing from that simplistic model when applied to actual water systems. The corrosivity of water should not be defined by pH and alkalinity alone and especially not from predictions from the idealized carbonate solubility models and published graphs. These statements do not negate the importance of the roles of pH and alkalinity in shaping water quality. Their roles in a given system must be included in a comprehensive corrosion investigation but must be determined empirically.

Likewise, orthophosphate should not be assumed to be generally applicable to all water systems for corrosion control without a comprehensive evaluation of a specific water system.

Keep an Updated Desktop Study and Timeline

A desktop study should look very much like the beginning of this report. Before monitoring in the distribution systems, existing information was gathered to understand the components and possible nuances of each water system. Chapter 2 lists information to be gathered to understand a water system's configuration.

In addition, the use of existing Lead and Copper Rule data can be instrumental in pinpointing periods of time where system operations might have changed in the water system to cause a change in lead or copper release. See Chapter 2.

Finally, insight from studying the Lead and Copper Rule data can be combined with other historical events in the water system's operation for a water system timeline. The timeline should be continued as operational and system changes are made. The timeline aids in evaluating possible reasons for water quality and regulatory compliance issues. See Chapter 2.

Perform a Routine Distribution System Water Quality Indicator Study and Take Action Immediately as Informed by Data

Chapter 4 describes how to use existing distribution system sampling sites, such as those selected for Total Coliform Rule compliance, as an inexpensive but highly informative distribution system water quality monitoring program. The common field tests of disinfection concentration and turbidity are indicators of the cleanliness and biostability of a water system. Tracking these parameters over time at critical flowing water sampling sites around the distribution system can identify times and locations of compromised water quality, including lead and copper release. The timeline, discussed in the previous paragraphs, can aid in identifying operational events that may have impacted those locations.

Weekly, monthly, or quarterly evaluation of such graphs with action taken immediately where indicated on the graphs can prevent small water quality issues from becoming larger.

Study the Water Quality of Problematic Buildings

Buildings or a subset of the buildings with the highest lead or copper release as identified in Lead and Copper Rule compliance sampling or with other water quality issues should be studied in more detail. Profile sampling as was described in Chapter 3 can be a thorough investigation for lead and copper release in cold water piping when combined with other water quality parameters described in Chapter 5.

If Possible, Routinely Gauge Lead and Copper Release

The indicator variables of turbidity and disinfection concentration are inexpensive and easy to work with as described above, but sometimes it is important to directly track the release of lead and copper and their relationship to many other water quality parameters. A comprehensive study of distribution system water quality can be carried out as described in this report. This is helpful for understanding how corrosion control strategies and operational changes are affecting the distribution system water quality. Chapters 5 to 11 of this report describe such a study. The use of a controlled distribution system monitoring station, such as a pipe loop apparatus, a PRS Monitoring Station, or a fully accessible building, is necessary in these comprehensive studies with monitoring performed frequently over time.

Consider Using Orthophosphate for Corrosion Control in Specific Cases

Many small and medium-sized water systems can make progress in controlling lead and copper release within one cleaning season. Water System K is an example of coming into compliance with the Lead and Copper Rule after one season. The eight water systems in this study are also examples of making significant progress on lead and copper control after one season of cleaning and within the Lead and Copper Rule compliance timeline.

However, if improvement is not being seen as the water system is cleaned, orthophosphate dosing could be considered. Offline testing and then a partial system test should be done to determine if the orthophosphate lowers the potential for consumer exposure to both dissolved and particulate lead and copper and if there are no negative side effects to dosing.

Larger water systems cannot be cleaned as quickly as smaller systems. It is possible that orthophosphate can lower the lead and copper release in a system while it is undergoing initial water system hygiene activities.

In no case should complete consumer protection be assumed with the use of orthophosphate or any other corrosion control chemical adjustment scheme. Cleaning, pipe replacement, and biostability efforts should continue with high priority.

Water systems that were not employing methods to ensure a clean system but now are may consider revisiting their corrosion control strategy. If their previous strategy included use of orthophosphate then testing should be conducted to evaluate if the current orthophosphate dose is appropriate. Testing may confirm that lowering their orthophosphate dose, now that they have a cleaner system, is appropriate.

The orthophosphate dosage should never be abruptly stopped as that would disrupt existing pipe wall scales where orthophosphate is providing structural support. Instead, the dosage should be lowered slowly and monitored for lead and copper release trends by comprehensive testing using a distribution system monitoring station or other pipe loop-style apparatus. That is, no water quality change should be done quickly or blindly. This report describes the tools and methods that can be used in order to make a data-informing water quality change.

If there is concern over lead release from metal alloys such as brass, offline PRS Monitoring Station or pipe loop tests can be run using brass plates or pipes to determine the response of brass to water without orthophosphate dosing.

If a decision is made to use orthophosphate, polyphosphates in the corrosion chemical product should be avoided. Polyphosphates have the potential to hold lead and copper in solution instead of decreasing their concentrations. In addition, the total phosphorus sent to the wastewater treatment plant is higher in meeting orthophosphate dosage goals when an additional fraction of the corrosion control product includes polyphosphate than if the product included only orthophosphate.

An additional consideration for using orthophosphate for corrosion control is to use a dose sufficient to form the desired protective scales on the metal surfaces. Water System A was successful in forming protective scales at a dose averaging 0.6 mg/L as PO4. Literature on phosphate dosing suggests an initial dose of 3.0 to 3.5 mg/L as PO4 with a maintenance dose of 1 mg/L as PO4 (EPA 2016a). In the other water systems using lower orthophosphate dosages, little to no phosphorus was found on the metal surface scales. That is, if orthophosphate dosing is to occur, then the dose must be sufficient in order to develop the desired scales.

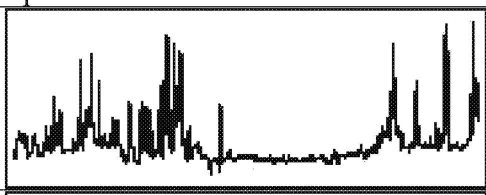
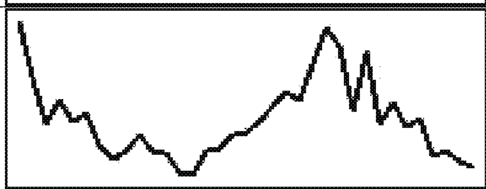
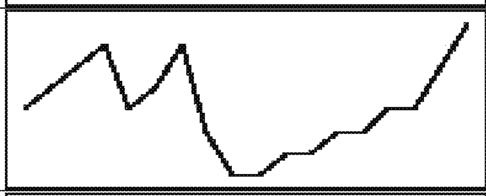
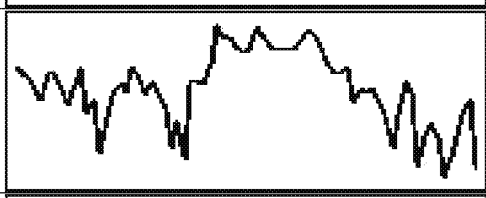
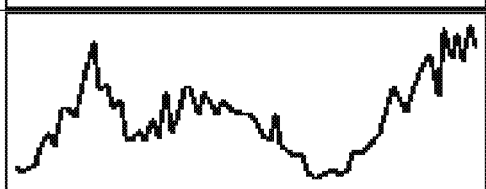
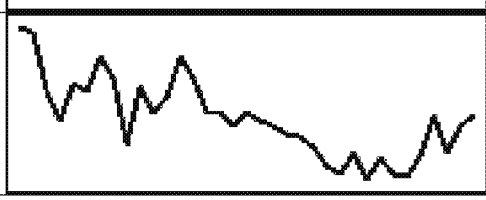
Perform an Environmental Impact Analysis of Phosphorus before Selecting Orthophosphate for Corrosion Control

If contemplating using a phosphate-based corrosion control chemical, begin a dialogue with the associated wastewater treatment facility personnel. Chapter 12 lists steps to evaluating the impact of the corrosion control strategy on meeting phosphorus discharge limits.

A portion of phosphate-dosed water also runs directly into natural bodies of water when used for outdoor purposes or industrial cooling water purposes. Consider the impact of the phosphate on the receiving body of water, especially using the phosphorus discharge limits determined by regulatory agencies.

APPENDIX A
CORRELATIONS

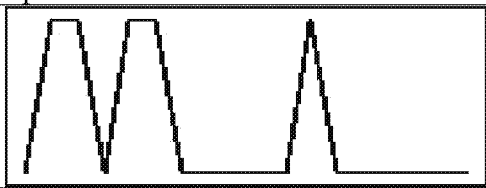
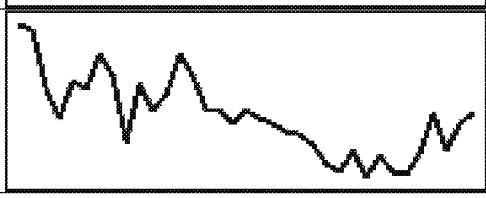
WATER SYSTEM A

Parameter	Sparkline	
Alum Dosing		in flowing water influent to the monitoring station
Aluminum		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

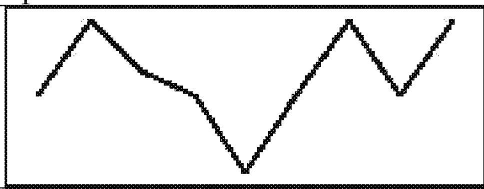
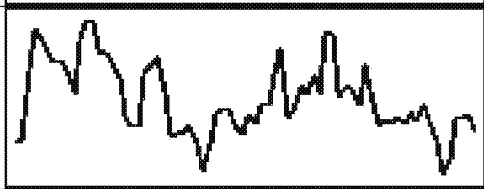
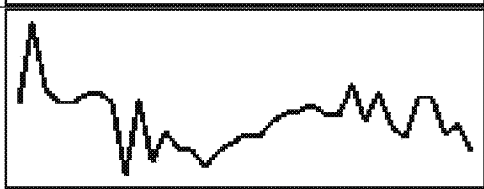
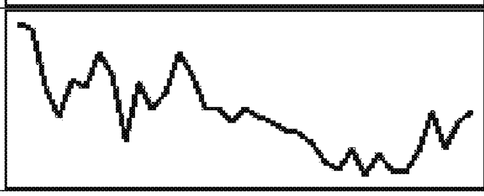
Alum (aluminum sulfate) was dosed the most in the colder months. Sulfate concentration in the water followed the alum dosing trend. Aluminum appeared to be stored on the pipe wall and was released mostly in dissolved form during the summer when alum dosing was at its lowest. The aluminum trend was inverse to the sulfate trend.

pH trended oppositely to alum dosing as alum lowered the pH of the water. Turbidity in the distribution system followed the alum dosing trend. Turbidity and pH trended inversely.

Dissolved lead peaked in the summer when pH was high and turbidity and alum dosing were low. Dissolved copper followed an opposite trend from dissolved lead in the summer. Dissolved copper trended with dissolved lead earlier in the year suggesting that different forces were at work in the colder months than in the warmer months.

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

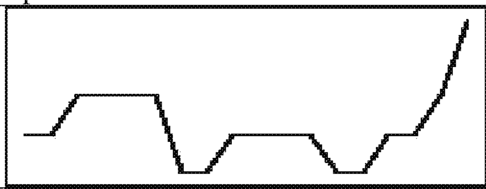
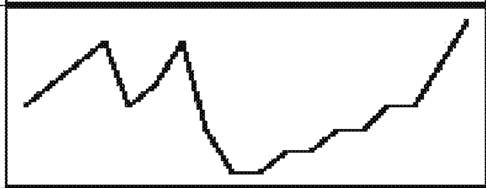
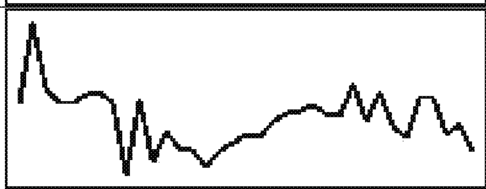
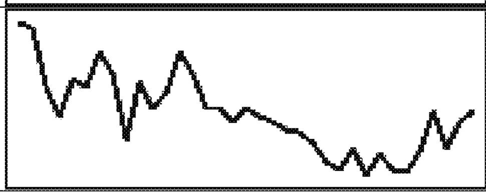
Dissolved lead and dissolved copper did not trend with alkalinity. Dissolved lead trended with pH in the summer but this relationship appeared to be related to alum dosing or some other factor influencing both dissolved lead release and pH. Dissolved copper trended oppositely with pH in the summer.

Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

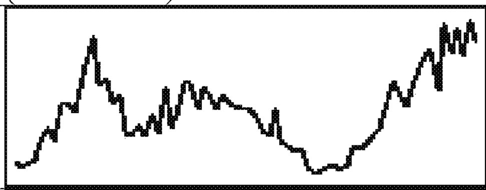
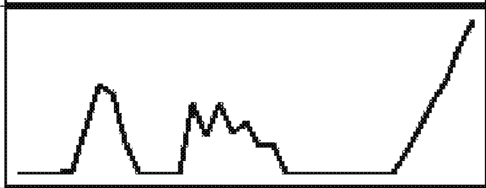
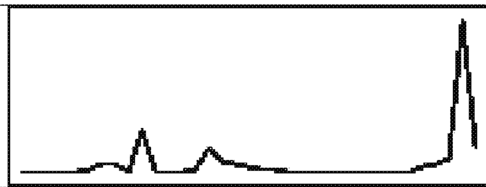
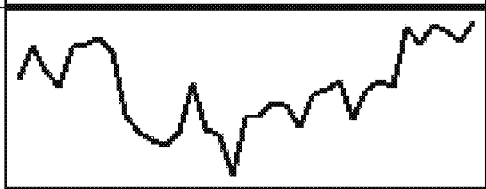
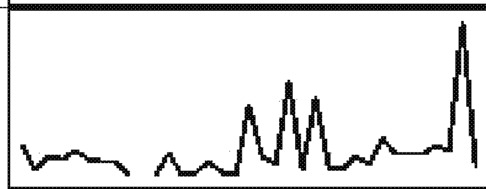
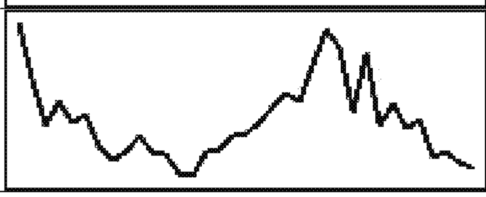
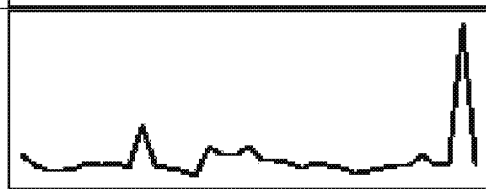
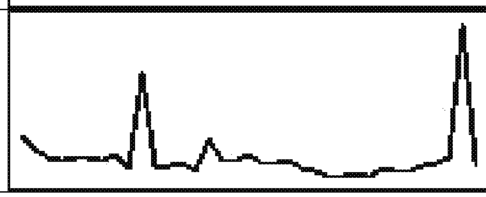
Dissolved lead increased with orthophosphate most likely because of other factors and not because of a cause and effect relationship between orthophosphate and dissolved lead. It is possible for phosphorus to be released from accumulations on pipe walls either as inorganic compounds or as incorporated into biological materials. Perhaps a pipe wall release would create this relationship between dissolved lead and orthophosphate.

Total phosphorus continued to increase at the end of the monitoring period (autumn) while orthophosphate decreased. It is possible that some orthophosphate was incorporated into biological materials at that time utilizing the phosphorus as organically-bound instead of as orthophosphate.

Copper was lowered as orthophosphate increased, but this also does not imply cause and effect, especially when observing the other complicated summer patterns.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Chloride and sulfate increased as the temperature warmed and continued into the fall. Dissolved copper began an increase in mid-summer and then followed parameters such as chloride and sulfate in the fall.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum		
Copper		

System water total iron followed the turbidity trend where the largest increase was at the end of the monitoring period in the fall. System water total manganese increased in the fall with turbidity and iron. System water aluminum (which was mostly in dissolved form) followed the dissolved lead release pattern seen previously while manganese, also mostly dissolved, somewhat followed the dissolved copper release trend.

Particulate copper was co-released with particulate iron, manganese, and aluminum in the copper test chamber.

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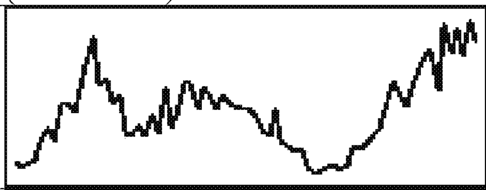
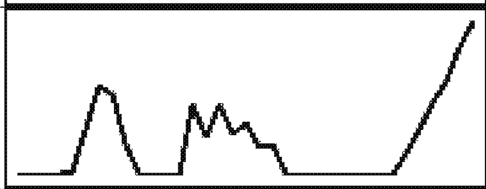
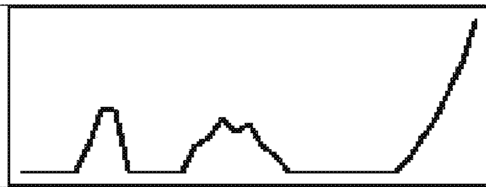
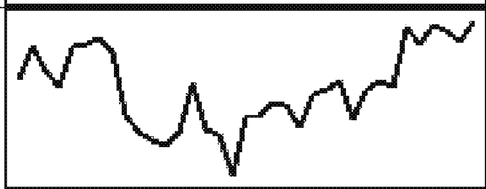
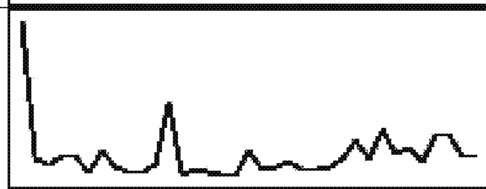
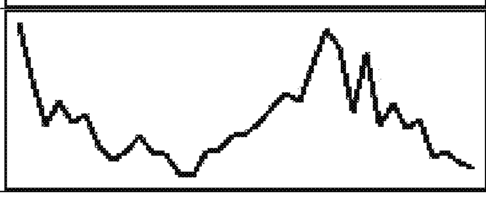
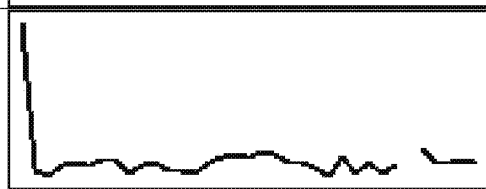
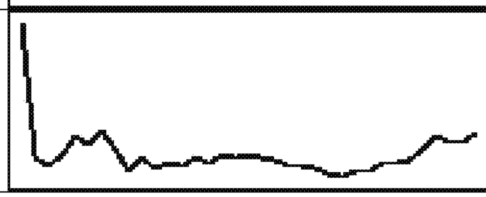
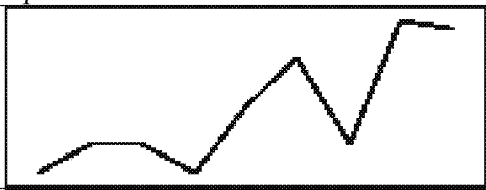
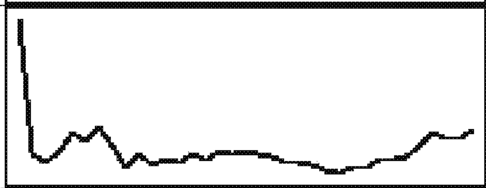
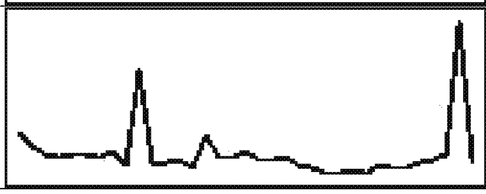
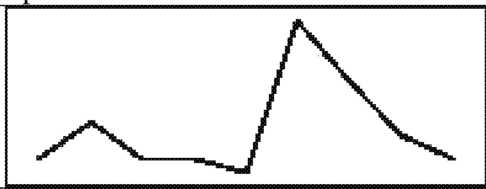
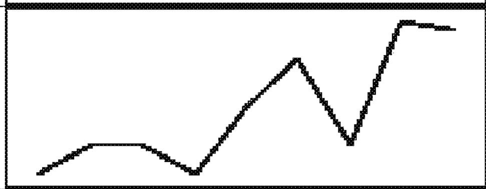
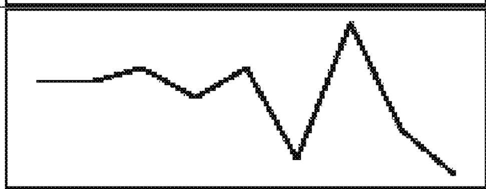
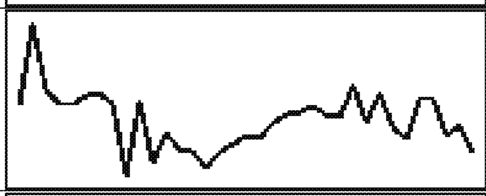
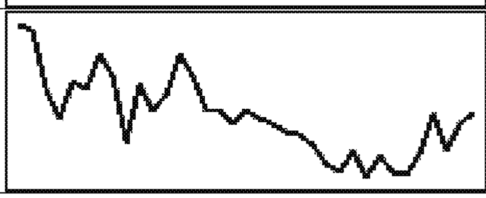
Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum		
Lead		

Particulate lead was co-released with particulate aluminum and manganese in the lead test chamber.

Parameter	Sparkline	
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water

Nitrite/nitrate began an upward climb as the temperature warmed. Particulate lead and copper release increased in fall along with nitrite/nitrate.

Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

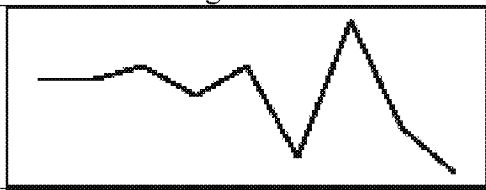
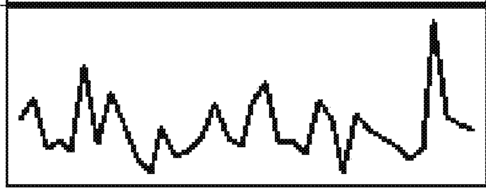
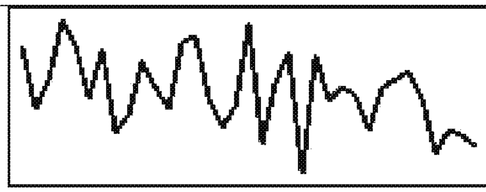
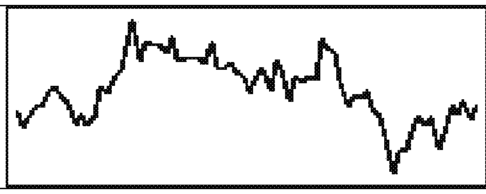
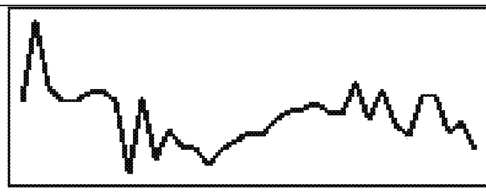
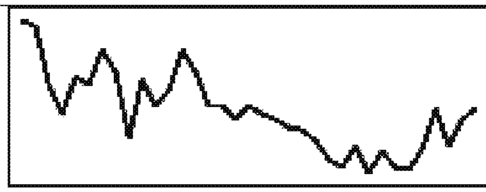
As the temperature warmed, the chloramine disinfection released free ammonia. This became food for microorganisms and the nitrification process began as ammonia was transformed into nitrite and nitrate by microorganisms. Nitrite/nitrate had a steady increase with variability into the fall while ammonia had a peak in the summer.

Just after the ammonia peak, dissolved organic carbon peaked. Dissolved organic carbon trended oppositely to nitrite/nitrate.

Dissolved lead release appeared to peak in the summer over the ammonia and dissolved organic carbon peaks while dissolved copper release followed an opposite trend.

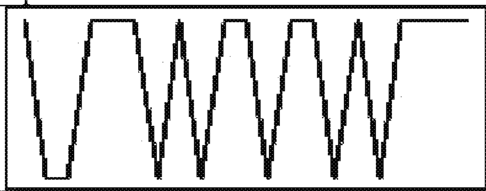
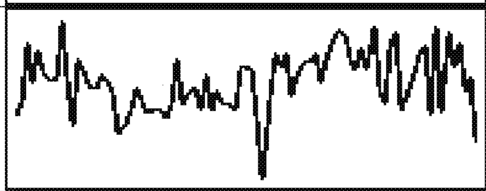
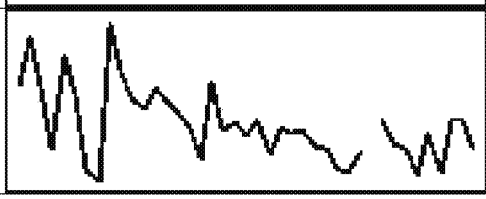
Dissolved copper and nitrite/nitrate increased into fall.

Given these distinct nitrification patterns, the patterns associated with alum dosing previously discussed can be theorized to be another effect of nitrification. Even the release of particulate lead, copper, and other metals as nitrite/nitrate increased in the fall could possibly be an effect of nitrification.

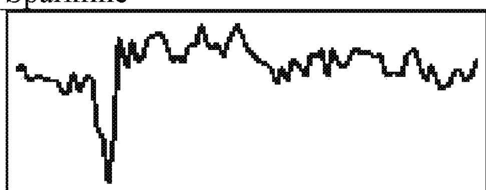
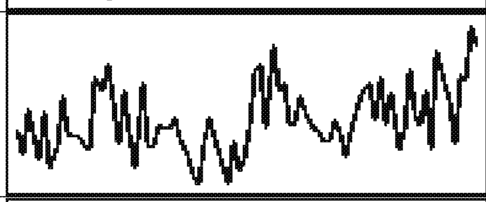
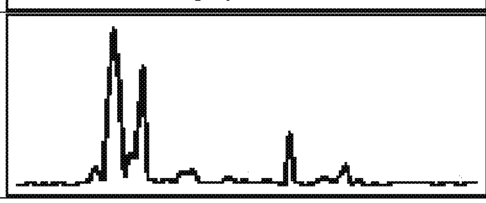
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

No clear trends were seen between dissolved organic carbon, microbiological population, disinfection concentration, and dissolved lead and copper release.

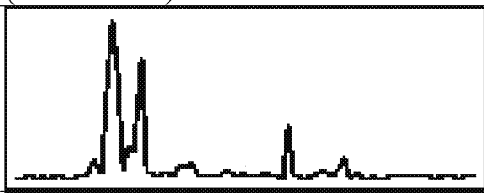
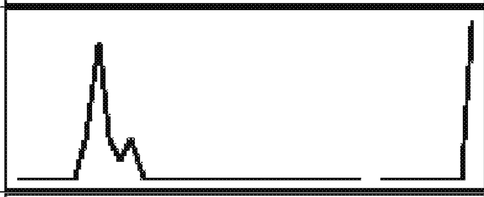
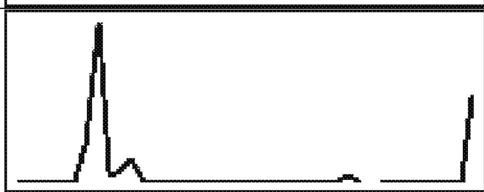
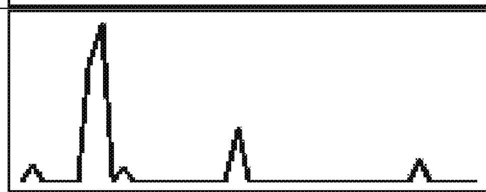
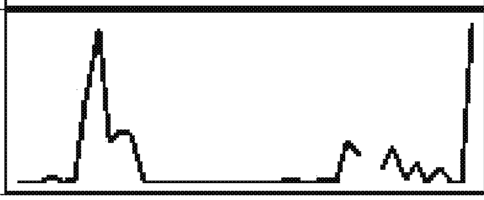
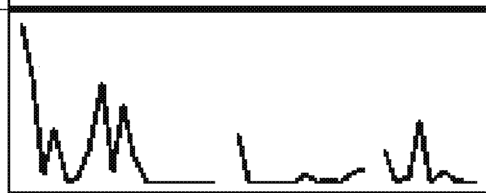
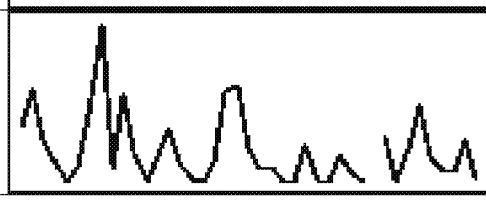
WATER SYSTEM B

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

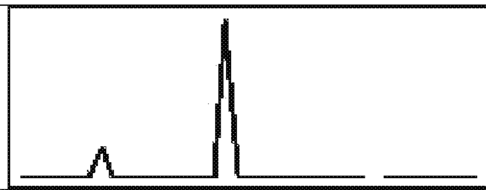
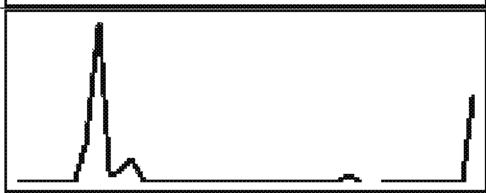
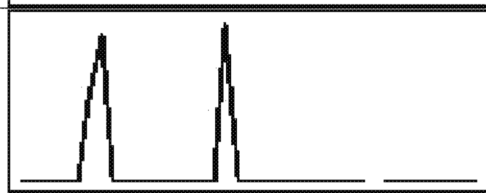
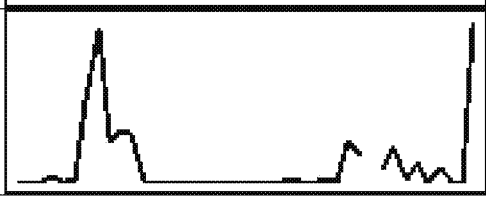
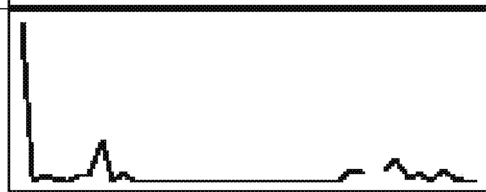
No correlations were seen between pH and alkalinity and dissolved lead and copper release. Dissolved lead and copper release trended together.

Parameter	Sparkline	
Oxidation/ reduction potential		in flowing water influent to the monitoring station
Conductivity		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station

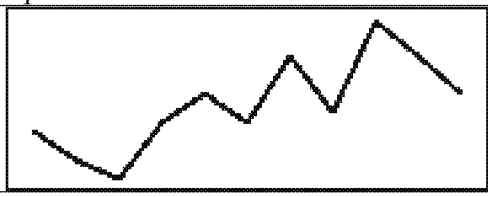
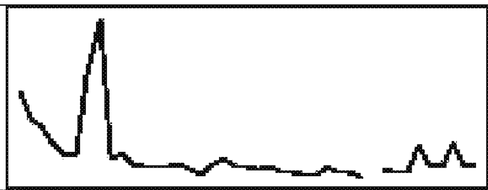
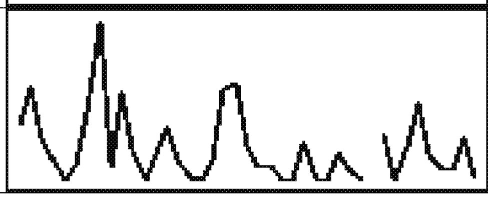
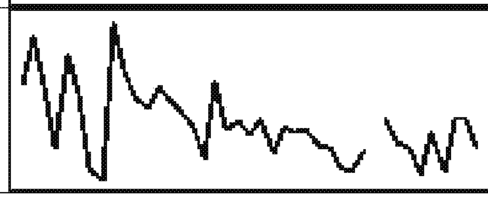
There was water main flushing in the first August of the monitoring program near the monitoring station. The lowest ORP was seen in the system water accompanied by an increase in both conductivity and turbidity. Conductivity continued to increase over time.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum		
Copper		

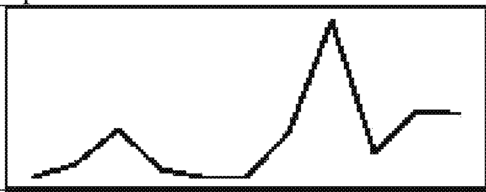
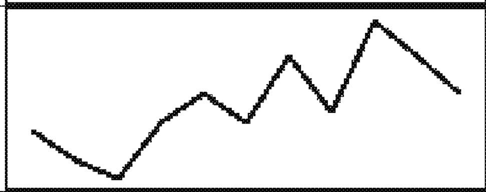
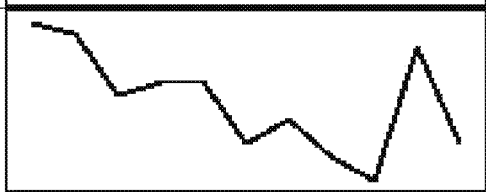
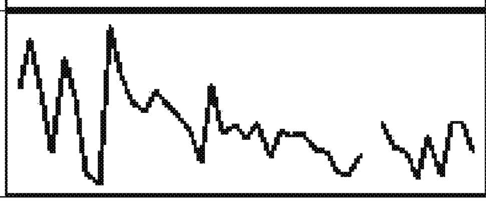
The August water main flushing event appeared to have increased turbidity, iron, manganese, and aluminum in the system water. The effect was seen in the copper test chamber release of all four metals. In general, particulate copper release trended with particulate aluminum, manganese, and possibly iron release.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum		
Lead		

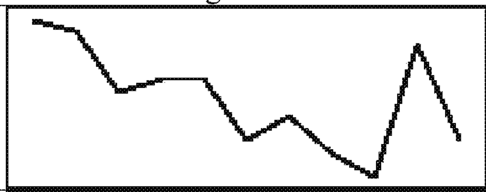
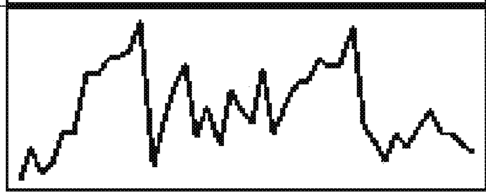
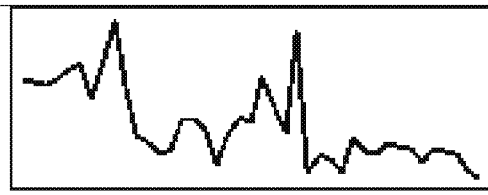
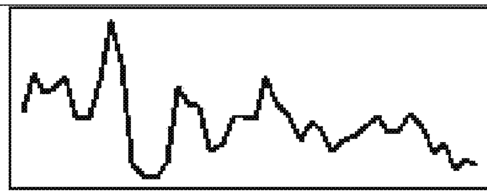
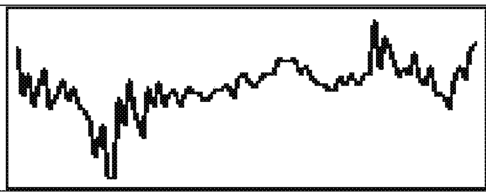
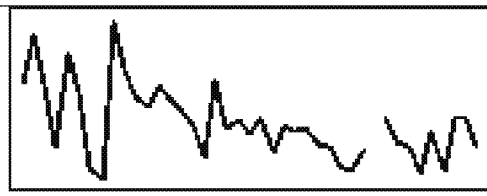
In general, particulate lead release trended with particulate aluminum release. Particulate iron and manganese trended together and possibly with particulate lead.

Parameter	Sparkline	
Nitrite/ Nitrate		in flowing water influent to the monitoring station
	Particulate Metal	Dissolved Metal
Lead in lead test chamber stagnating water		
Copper in copper test chamber stagnating water		

Particulate lead and copper releases were not trending with the increase of nitrite/nitrate to the degree that was seen in Water System A. They were trending in an opposite direction with a small increase in the fall. Dissolved lead and particulate lead trended together. Dissolved copper and particulate copper trended together. All of the metal forms decreased over all.

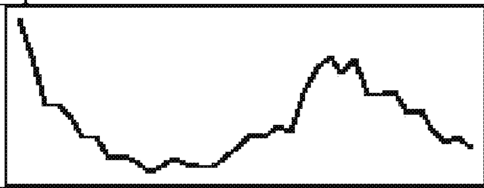
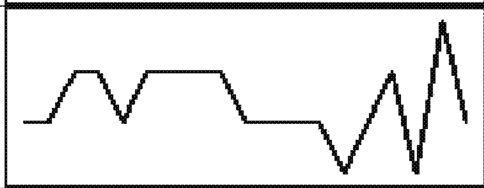
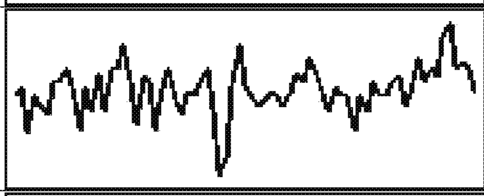
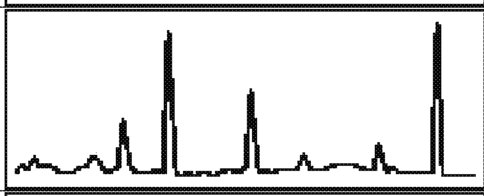
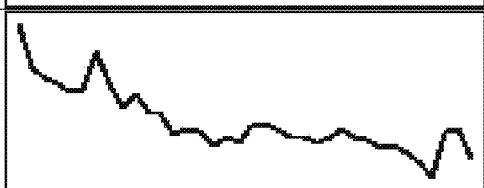
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

The nutrient graphs of Water System B look like those of Water System A where nitrification was occurring. Ammonia increased in the water system to a summertime peak. Dissolved organic carbon peaked just after the ammonia. Dissolved organic carbon appeared opposite in trend to nitrite/nitrate. Dissolved lead release, even though decreasing in general as the water system was cleaned, experienced an increase and then a decrease over the ammonia and dissolved organic carbon patterns. Dissolved copper release did this also but appeared to continue an upward climb with nitrite/nitrate whereas dissolved lead release continued downward. This was also similar to Water System A.

Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbiological Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

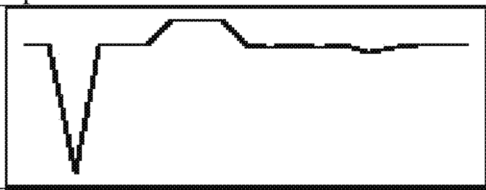
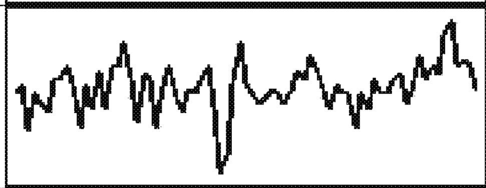
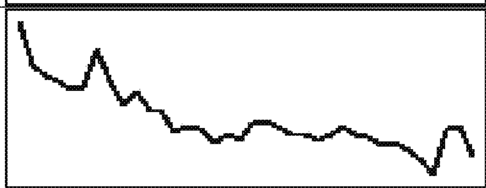
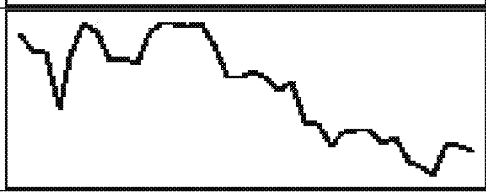
Disinfection appeared to follow an opposite trend to microbiological population. Dissolved lead and copper release appeared to follow microbiological populations in their respective test chambers.

WATER SYSTEM C

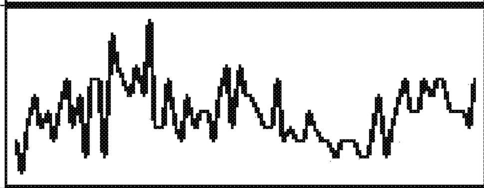
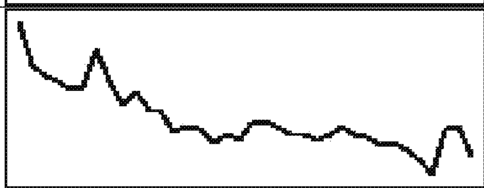
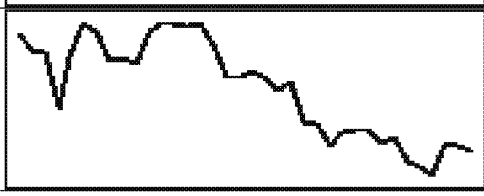
Parameter	Sparkline	
Aluminum		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Water System C used alum for coagulation like Water System A. A similar release of dissolved aluminum was seen in the summer similar to Water System A. The sulfate in the water was similar to A except that there was greater variation in the summer. Dissolved copper trended inversely with dissolved aluminum.

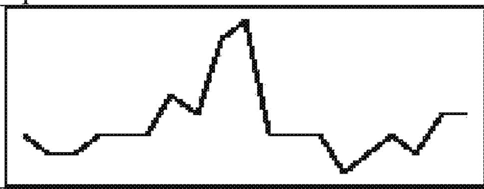
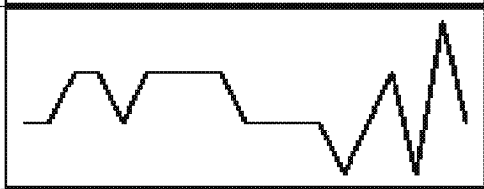
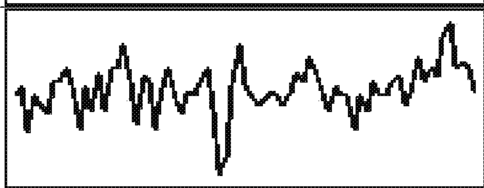
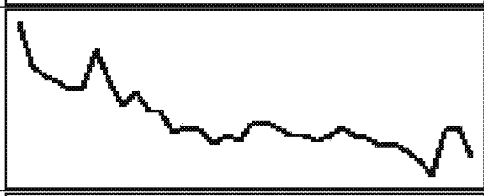
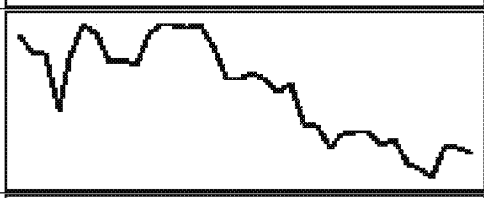
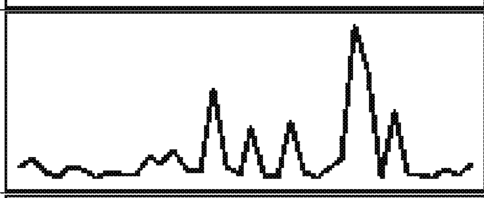
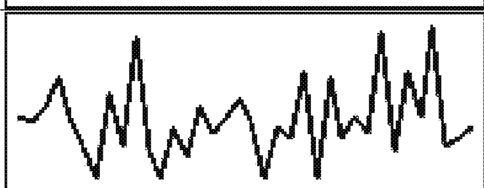
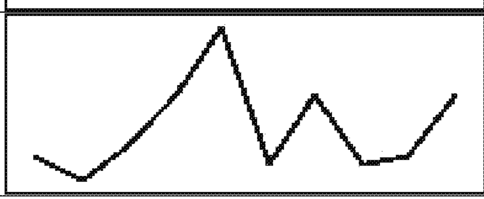
Dissolved lead and copper trended with each other and not opposite each other like in Water System A in the summer.

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

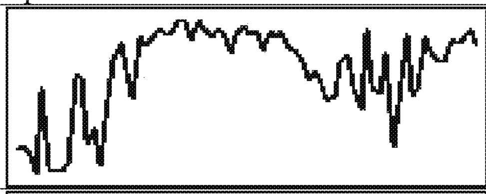
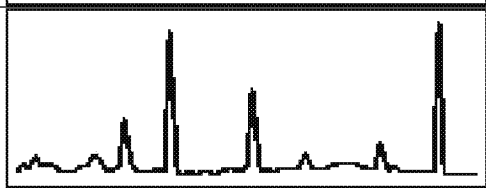
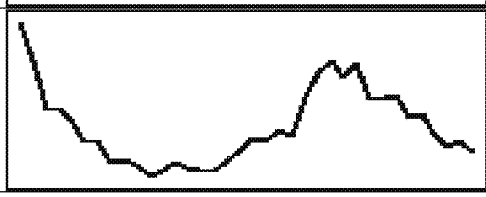
There appeared to be no similar trends between dissolved lead and copper release and alkalinity and pH.

Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

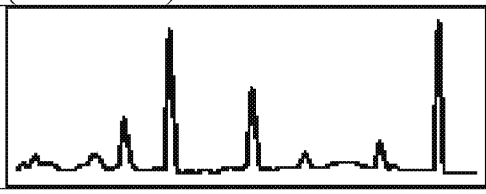
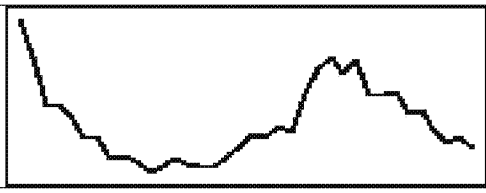
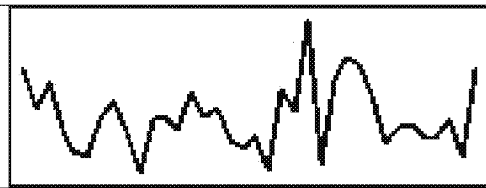
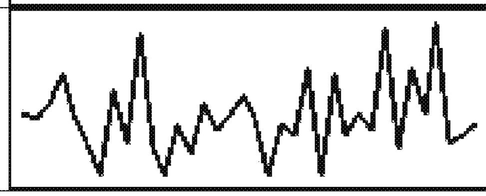
There was a possible common trend between total phosphorus/orthophosphate and dissolved lead and copper release. They all reached a minimum but phosphorus did so before the dissolved metals did.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water
Nitrite/ nitrate		in flowing water influent to the monitoring station

There was a jump in chloride in the late winter. The pH dropped when chloride was at its highest concentration. Nitrite/nitrate peaked just before the chloride peak. It is suspected that the late winter behavior may be related to runoff from roads with winter road salt into the lake and affecting the water quality far out about a mile at the water intake structures. Particulate lead release increased at that time but it may be coincidence because it continued to spike long after the chloride and nitrate event.

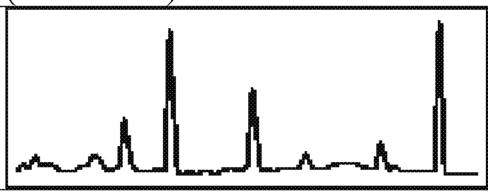
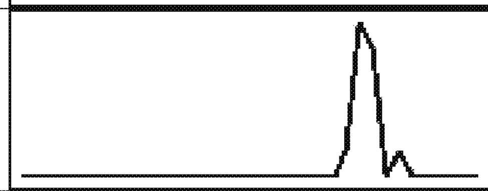
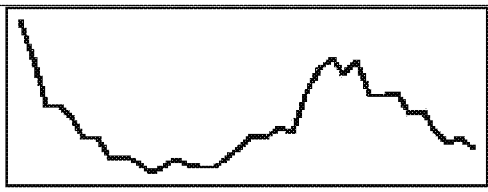
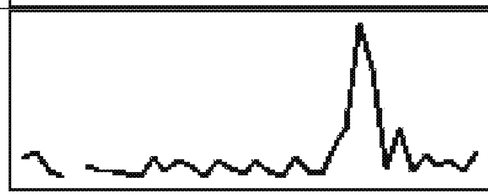
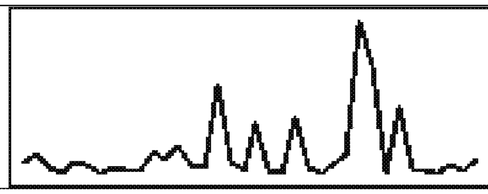
Parameter	Sparkline	
Oxidation/ reduction potential		in flowing water influent to the monitoring station
Conductivity		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station
Aluminum		in flowing water influent to the monitoring station

ORP and conductivity appear to trend together. Dissolved aluminum released in the system water appeared to trend opposite to ORP and conductivity. This is confusing since conductivity is an indication of dissolved solids in the water.

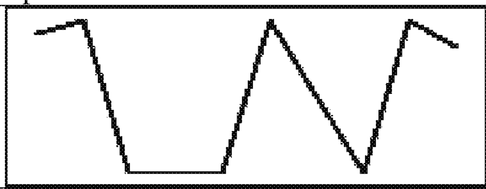
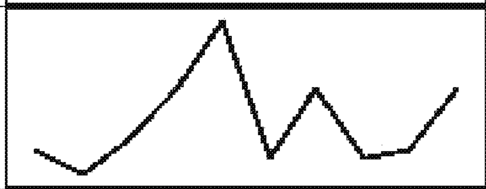
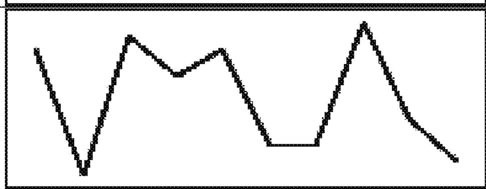
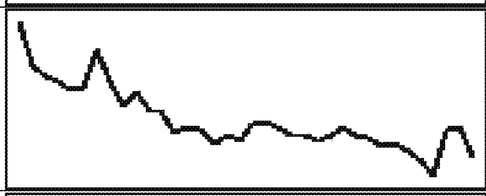
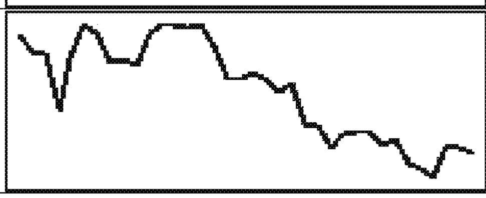
Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron	below detection limit	below detection limit
Manganese	below detection limit	below detection limit
Aluminum		
Copper		

Turbidity of the system water showed high spikes of particulates over time. However, the particulates could not be defined; iron and manganese were below detection limit and only total aluminum was measured above the detection limit.

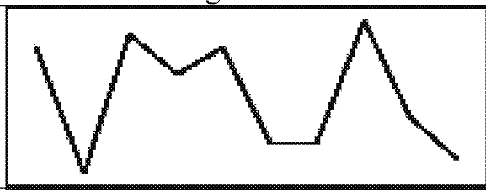
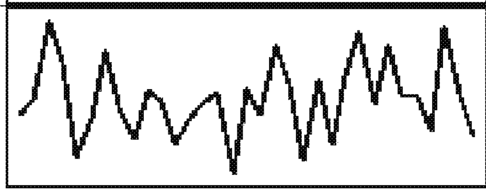
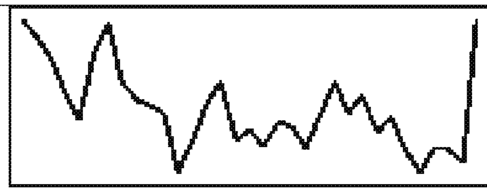
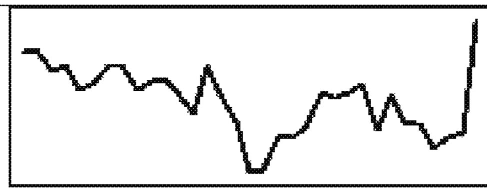
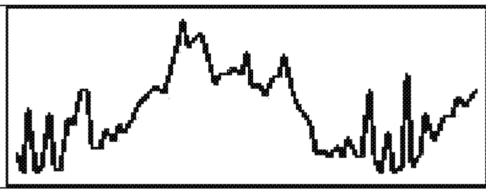
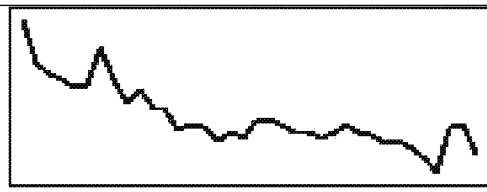
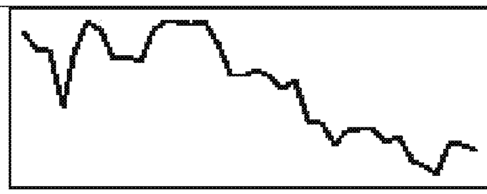
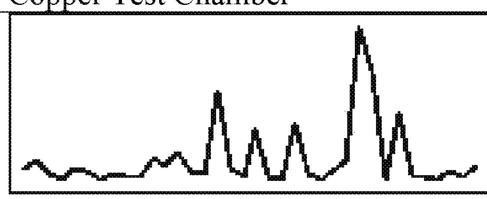
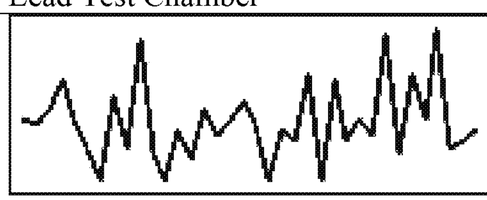
In the copper test chamber, particulate copper and particulate aluminum released together.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron	below detection limit	
Manganese	below detection limit	
Aluminum		
Lead		

In the lead test chamber, particulate lead and particulate aluminum released together. Toward the end of the monitoring period, particulate iron and manganese were measured as above detection limit in the events. The limit of detection for iron may have been too high to reveal more correlated trends. The manganese limit of detection was satisfactory but manganese was at very low levels in the water system.

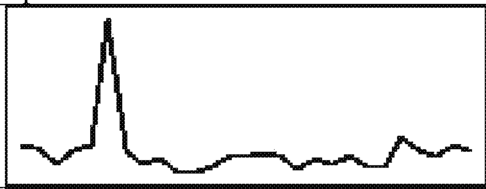
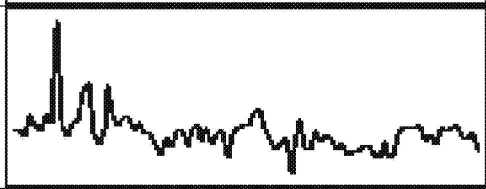
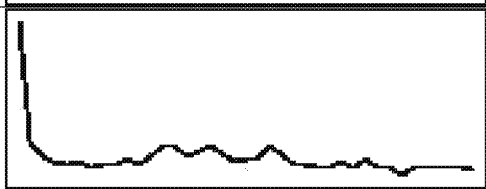
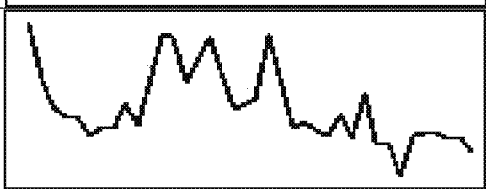
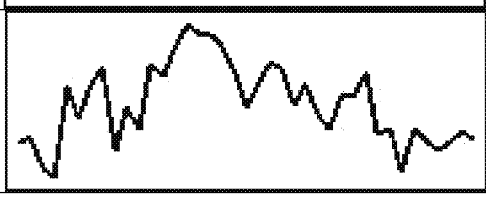
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

The nitrification pattern was not observed in Water System C.

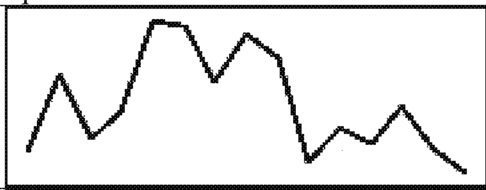
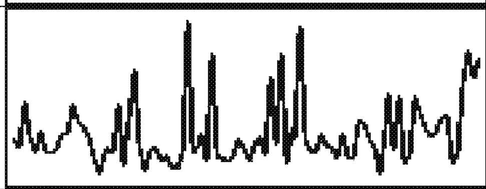
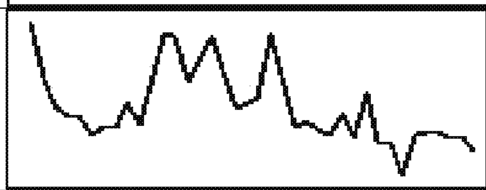
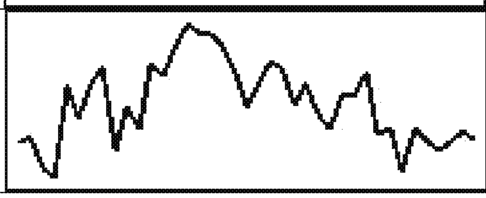
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber
Particulate Lead		 Lead Test Chamber
Particulate Copper		 Copper Test Chamber

There were possibly similar trends between microbiological populations and lead and copper release, especially copper release in particulate form.

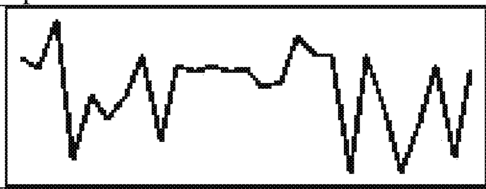
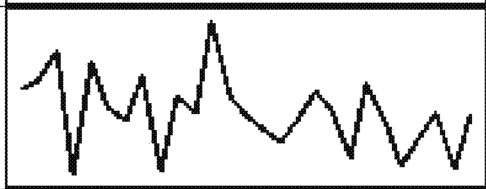
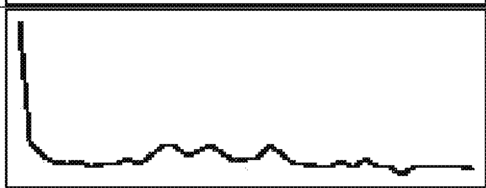
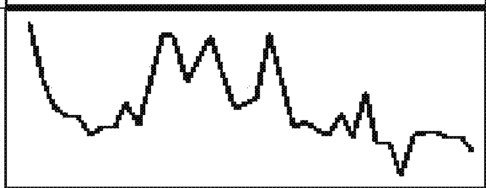
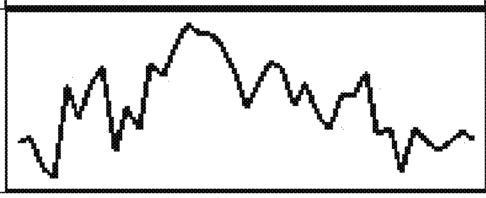
WATER SYSTEM D

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
		Repeat of dissolved lead graph but without initial high value
Dissolved Copper		in stagnating copper test chamber water

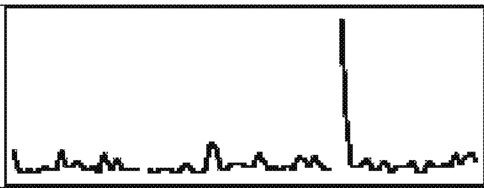
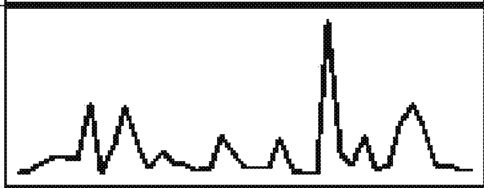
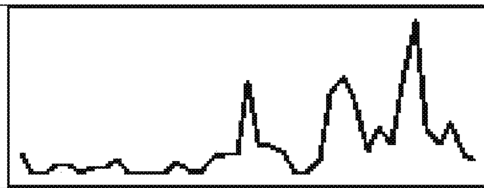
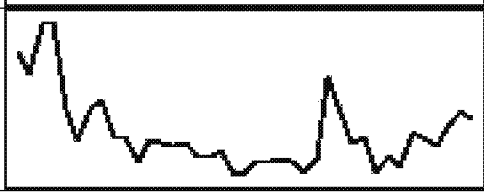
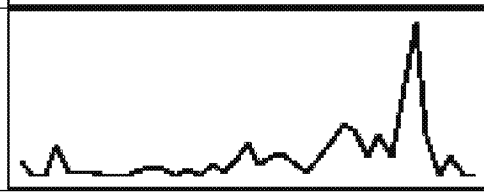
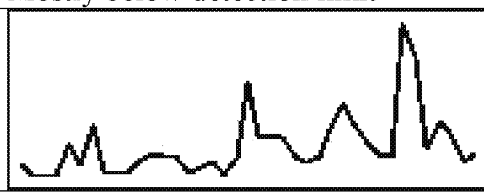
Alkalinity trended inversely to dissolved lead and copper release. This may have been a function of which wells were providing water to the monitoring station at the time of sampling. Note that dissolved lead and dissolved copper show similar release patterns after the initial high dissolved lead value is hidden.

Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
		Repeat of dissolved lead graph but without initial high value
Dissolved Copper		in stagnating copper test chamber water

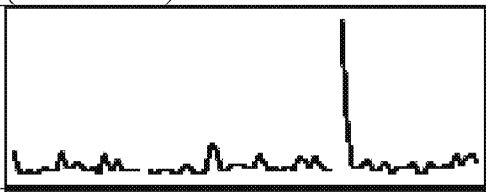
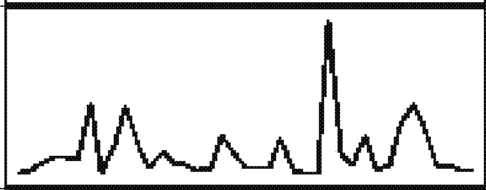
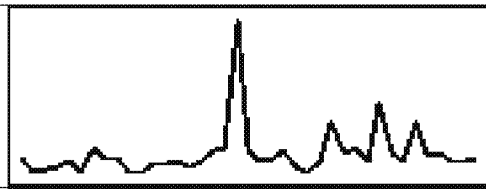
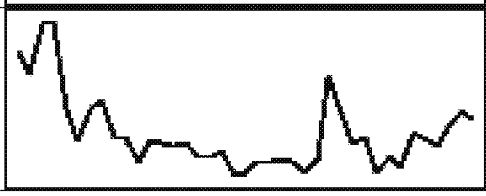
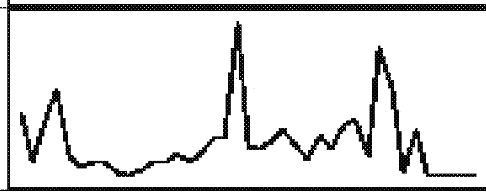
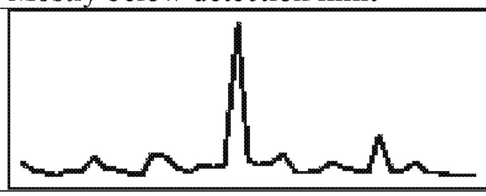
Dissolved copper and lead release appeared to trend with total phosphorus. This is theorized to occur from the presence of polyphosphate in the water holding the metals in the water. It could also be a microbiological phenomenon where total phosphorus is being released from pipe walls in organically-bound compounds. This could be a factor affecting metal solubility or there could be a third factor that influenced both parameters.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
		Repeat of dissolved lead graph but without initial high value
Dissolved Copper		in stagnating copper test chamber water

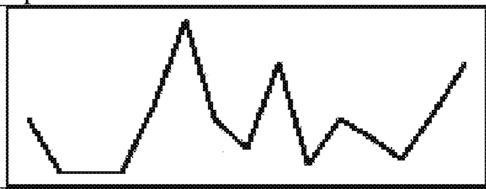
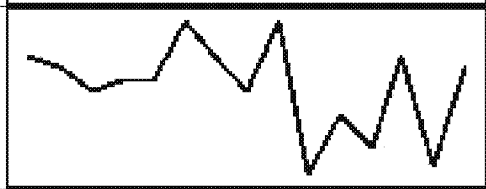
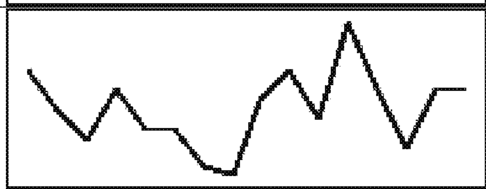
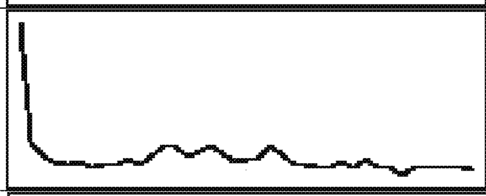
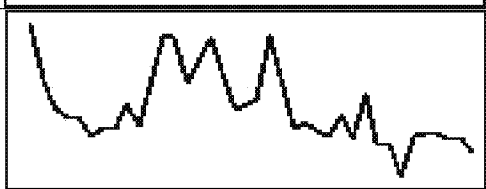
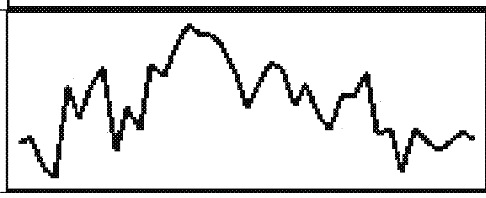
Chloride and sulfate appeared to trend together however they did not appear to be related to dissolved lead or copper release.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	Mostly below detection limit
Copper		

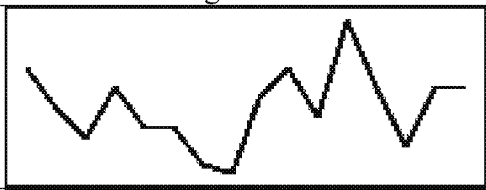
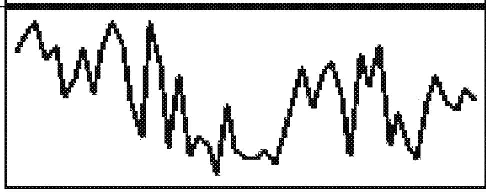
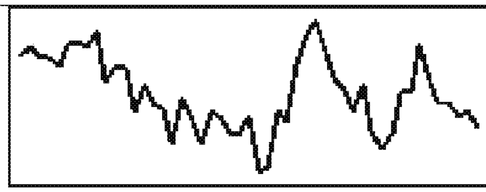
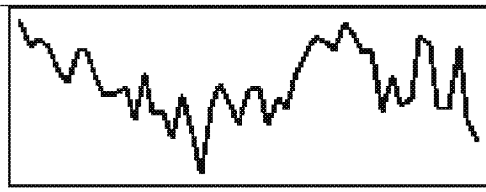
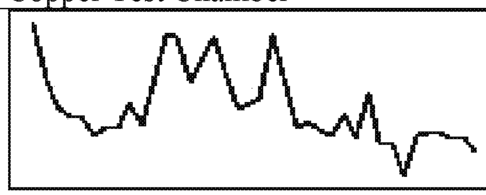
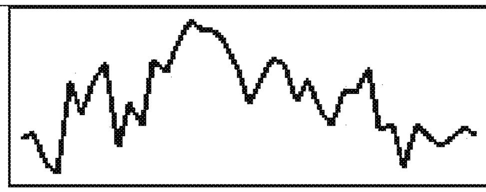
Particulate copper released with particulate iron and manganese. Iron and manganese and possibly turbidity trended together in the system water.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	Mostly below detection limit
Lead		

Particulate lead released with particulate iron and manganese. Iron and manganese and possibly turbidity trended together in the system water. Note that particulate lead and copper release were similar in trends.

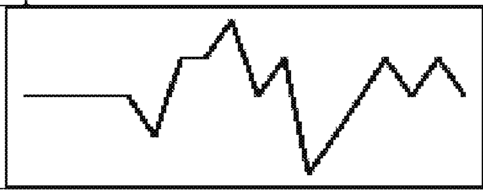
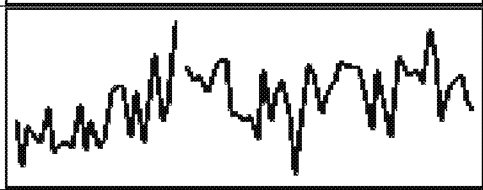
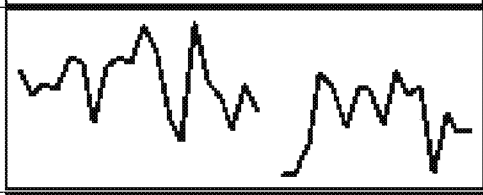
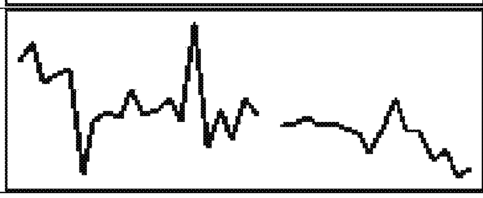
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
		Repeat of dissolved lead graph but without initial high value
Dissolved Copper		in stagnating copper test chamber water

Unlike nitrification patterns seen in Water Systems A and B, ammonia and nitrate trended together. Dissolved organic carbon appeared to trend opposite to nitrate as seen in the other water systems. Dissolved copper and lead release trended somewhat with the ammonia and nitrate patterns. Previously, it was shown that they possibly trended with phosphorus released from pipe wall accumulations.

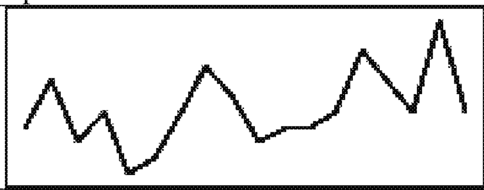
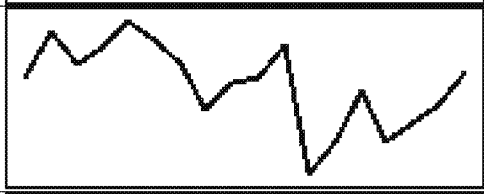
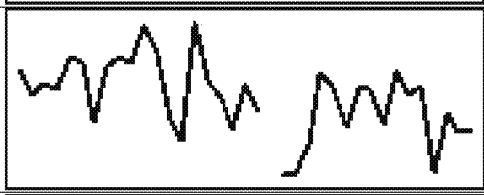
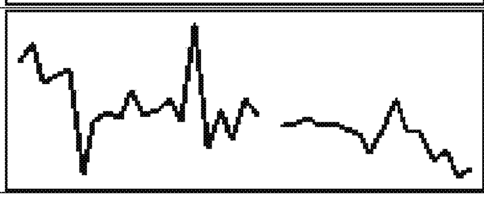
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

Dissolved organic carbon trended with the microbiological population. Dissolved lead and copper were trending oppositely to microbiological population.

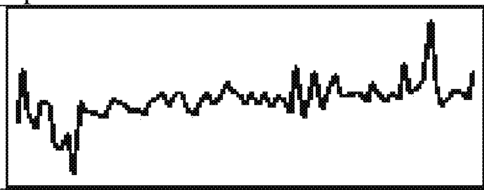
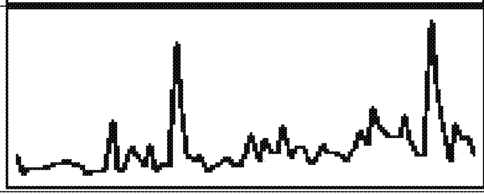
WATER SYSTEM E

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

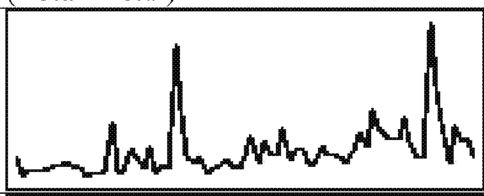
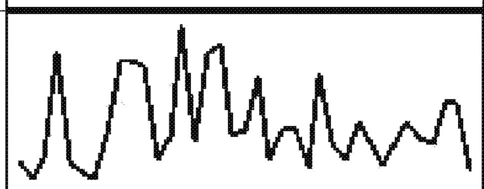
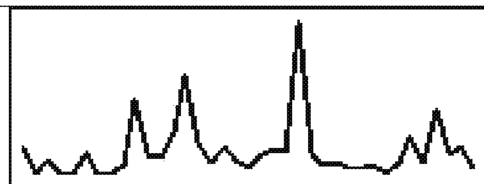
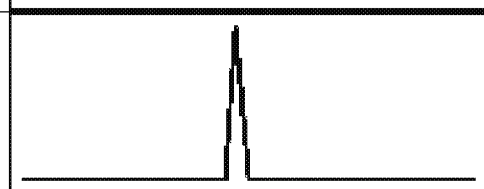
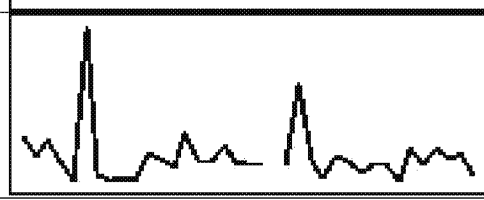
There were no common trends between alkalinity and pH and dissolved lead and copper release. Dissolved lead release was similar to dissolved copper release. Both decrease during the later monitoring period.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

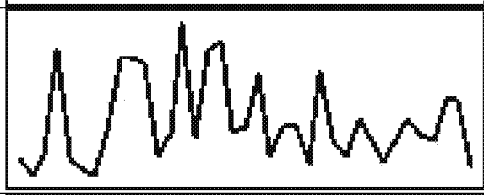
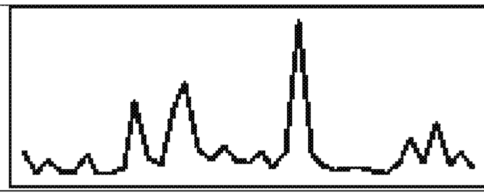
Chloride increased as sulfate decreased along with dissolved lead and copper release. The increasing chloride was from the use of new water softeners. It is theorized that the softeners kept out chemical and microbiological components of the system water from reaching the monitoring station.

Parameter	Sparkline	
Conductivity		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station

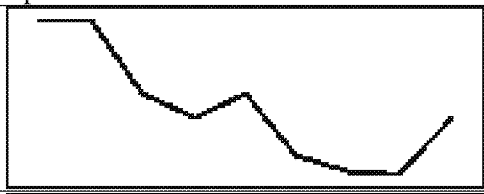
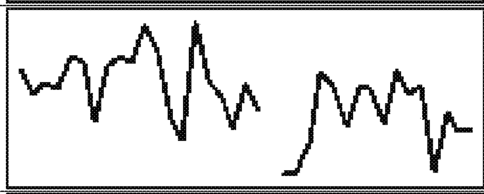
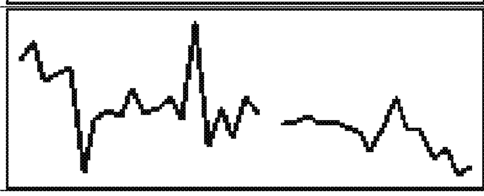
Both conductivity and turbidity of the system water increased over time. It was seen that the system water filter was producing more turbid water over time.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		Mostly below detection limit
Manganese		
Aluminum		
Copper		

Manganese was a main component in the system water in both dissolved and particulate form. Particulate copper released with particulate manganese in the copper test chamber.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		mostly below detection limit
Manganese		
Aluminum		Below detection limit
Lead		

Particulate lead released with particulate manganese in the lead test chamber.

Parameter	Sparkline	
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Dissolved organic carbon decreased over time as did dissolved lead and copper.

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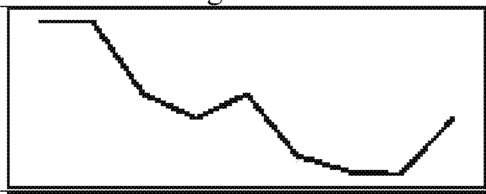
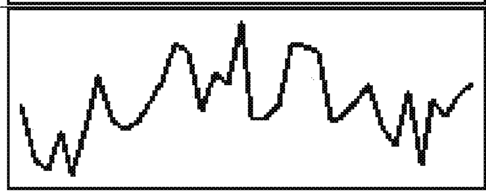
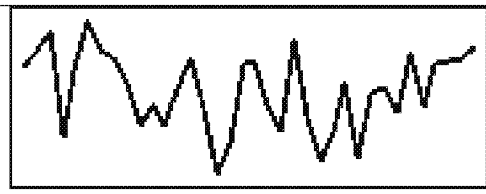
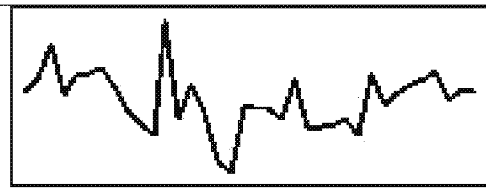
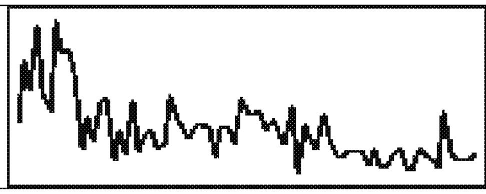
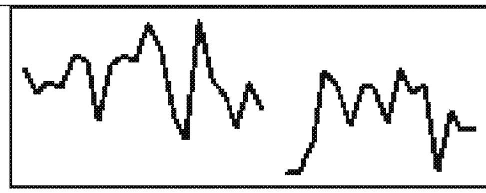
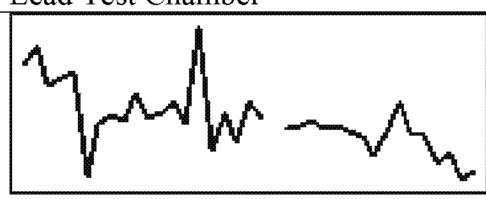
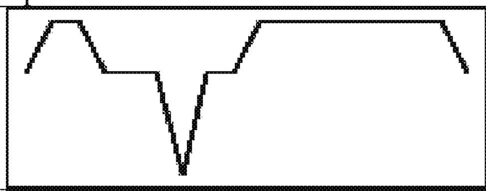
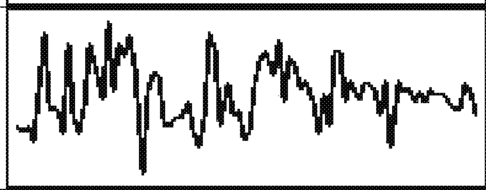
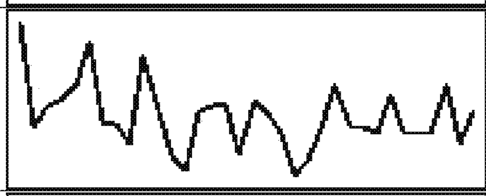
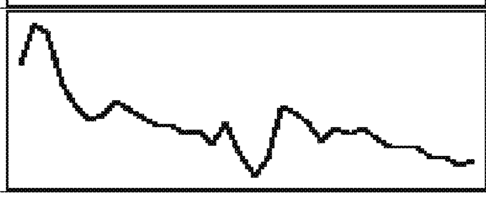
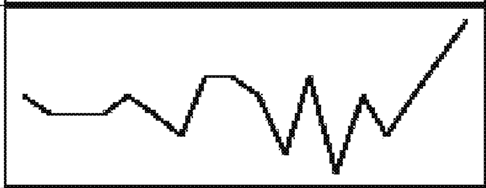
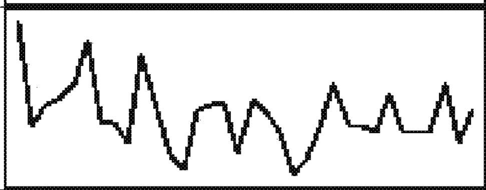
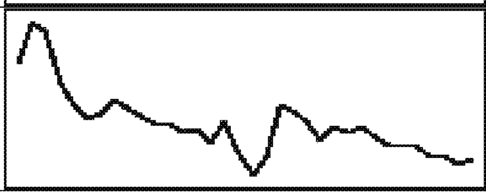
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

Dissolved organic carbon did not trend with microbiological population. Populations were increasing in the test chambers by the end of the monitoring period. Disinfection in the system water was dropping. Dissolved lead and copper dropped over time.

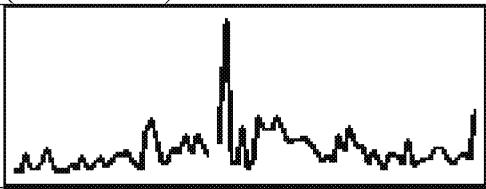
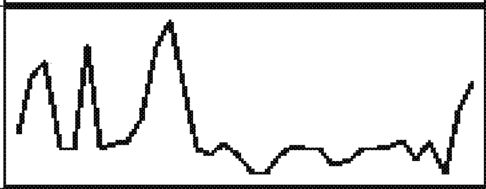
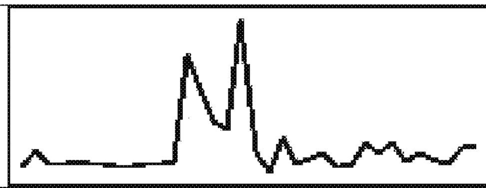
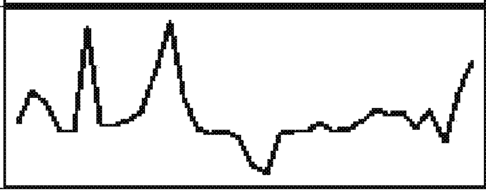
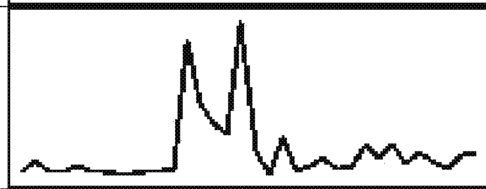
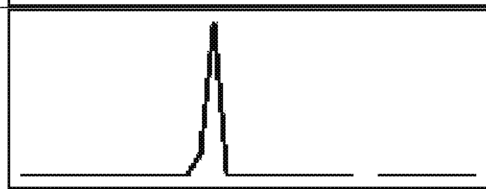
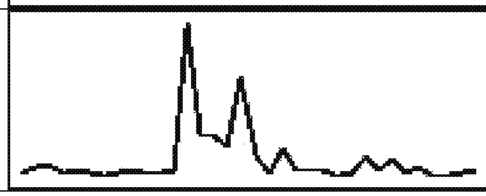
WATER SYSTEM F

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

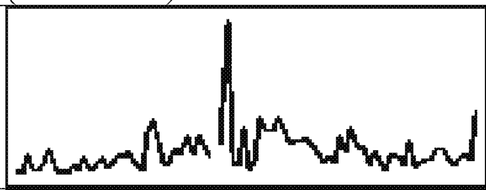
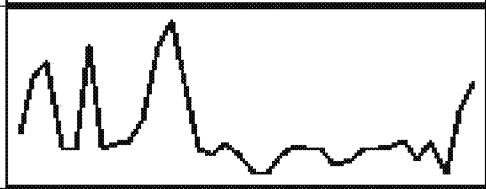
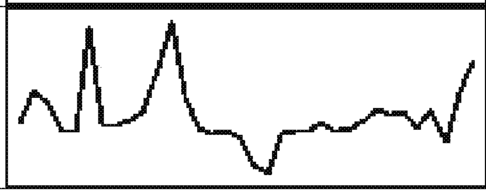
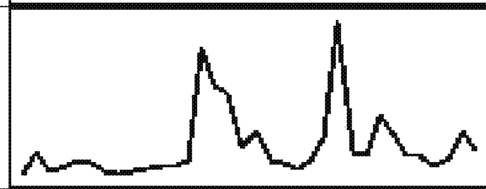
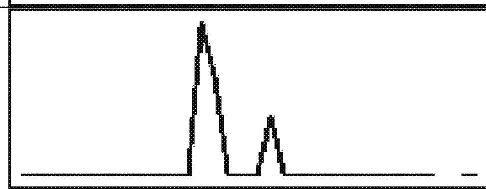
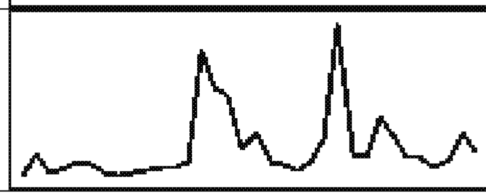
There were no common trends between alkalinity, pH, and dissolved lead and copper release.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

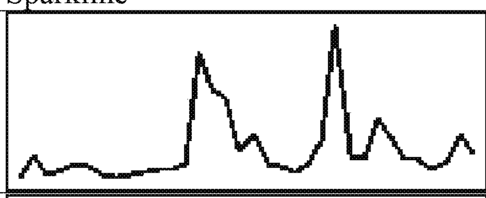
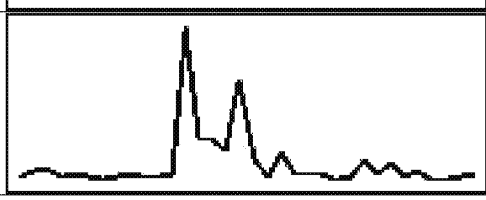
There were no common trends between chloride, sulfate and dissolved lead and copper release.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	
Copper		

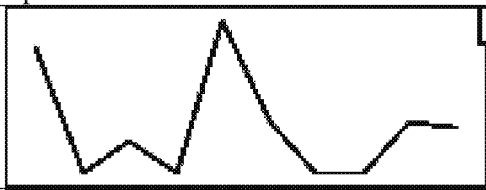
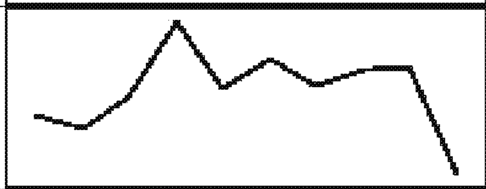
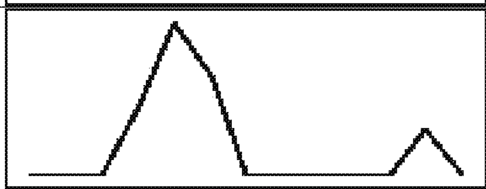
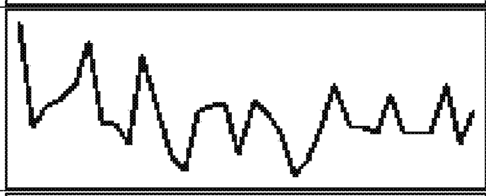
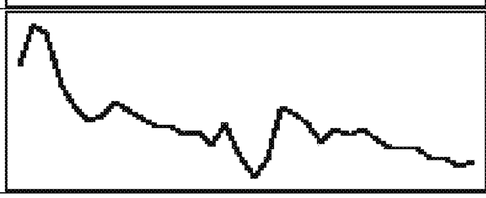
Iron and manganese trended with each other in the system water. Particulate copper released with particulate iron, manganese, and aluminum in the copper test chamber.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	
Lead		

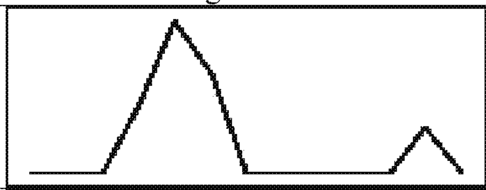
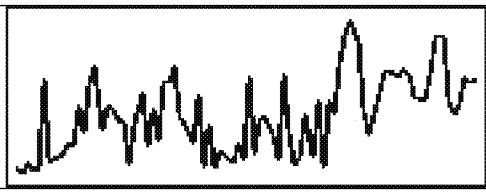
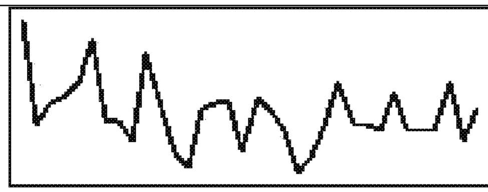
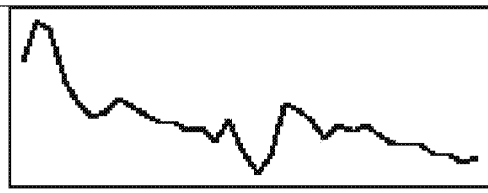
Particulate lead released with particulate iron, manganese, and aluminum in the lead test chamber.

Parameter	Sparkline	
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water

Particulate lead and copper release trended in a similar pattern.

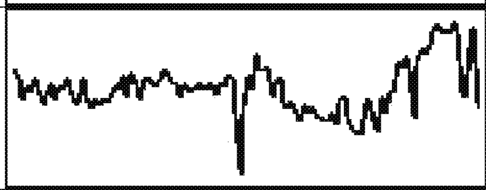
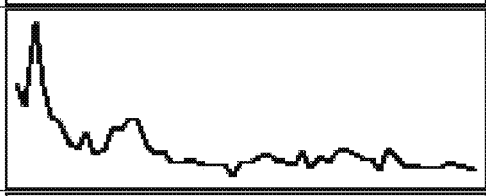
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

There were no common patterns between the nutrients and the dissolved lead and copper release.

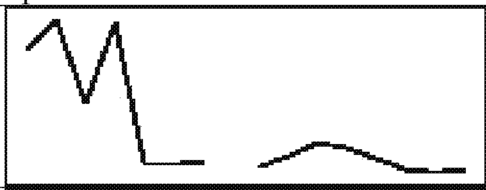
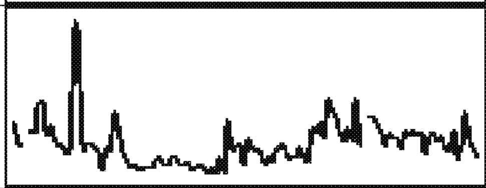
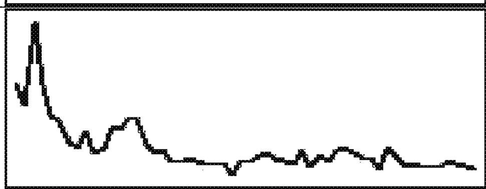
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

Dissolved copper release trended with microbiological population. Dissolved lead release somewhat trended with microbiological population. Disinfection increased as population decreased.

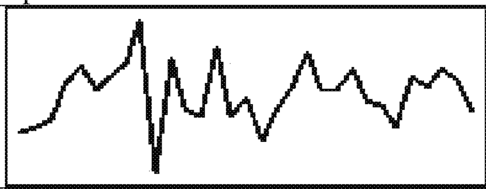
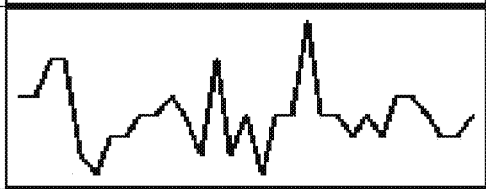
WATER SYSTEM G

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

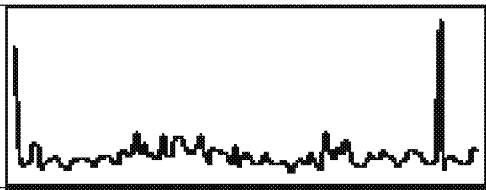
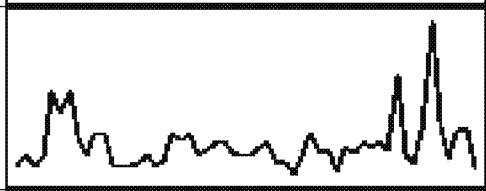
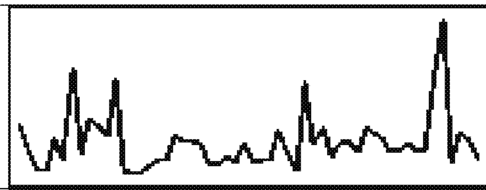
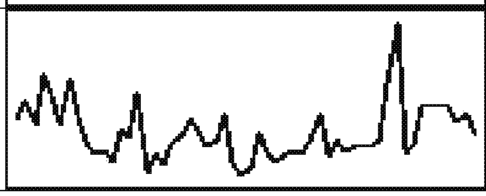
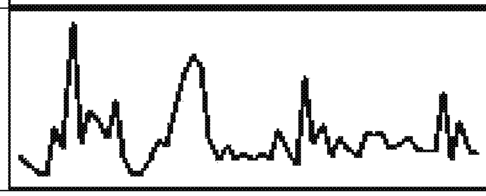
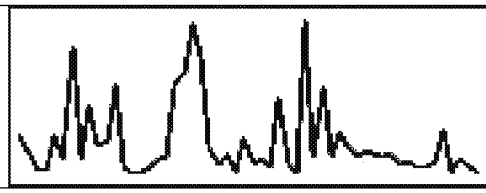
There were no common patterns between alkalinity, pH, and dissolved lead and copper release. Dissolved lead release was similar to dissolved copper except that copper stayed higher for longer and then dropped to a lower value and continued to decrease along with lead.

Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

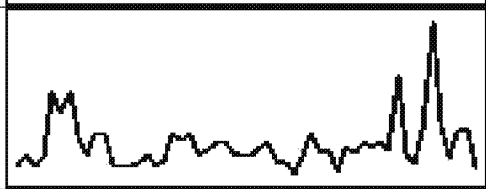
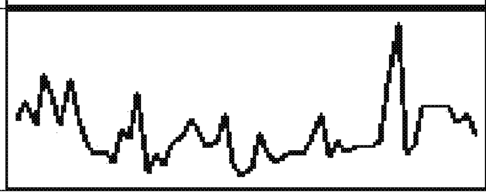
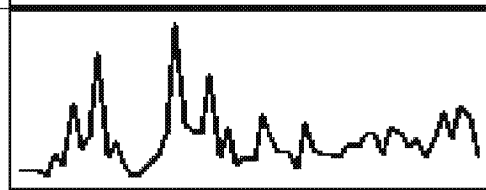
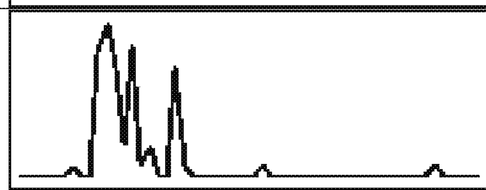
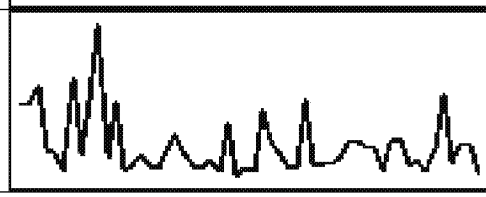
Dissolved copper was possibly related to total phosphorus in that both stayed high at first and then dropped greatly.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

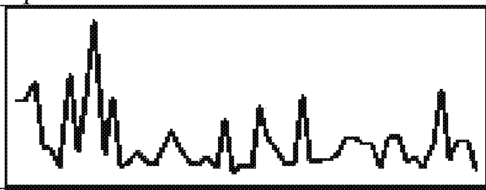
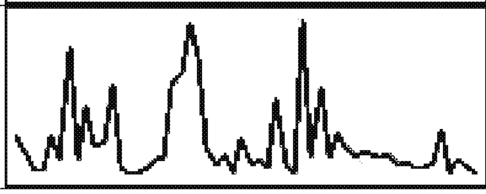
Chloride and sulfate appeared to be somewhat related but did not trend with dissolved lead and copper release.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	Below detection limit
Copper		

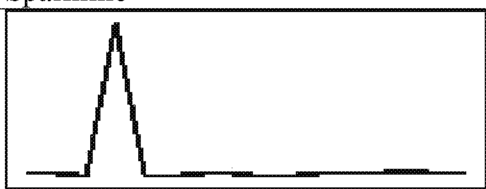
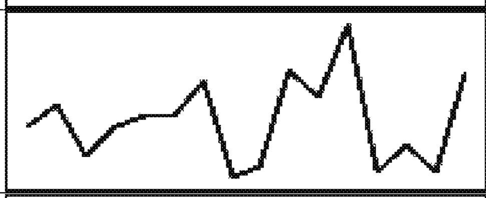
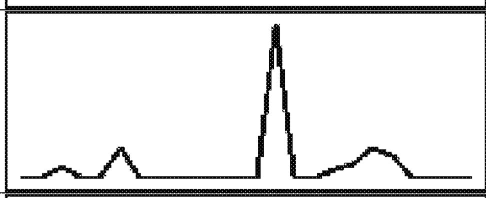
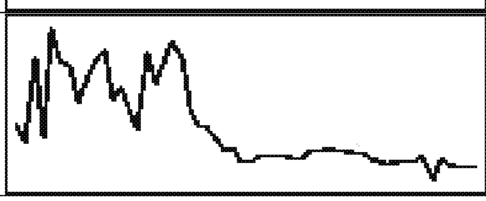
Particulate copper released with particulate iron and manganese in the copper test chamber. Iron and manganese trended together in the system water.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Below detection limit	
Lead		

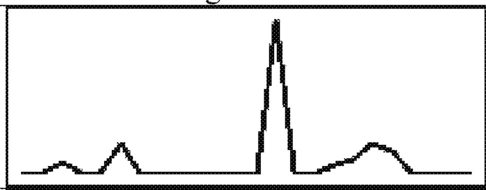
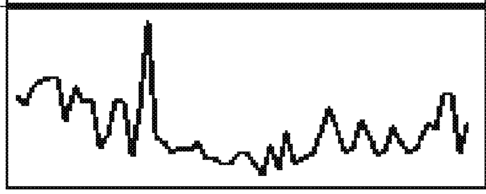
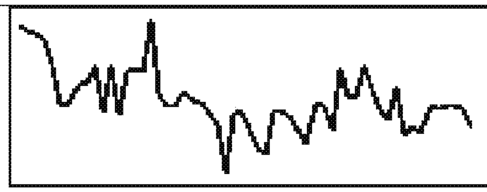
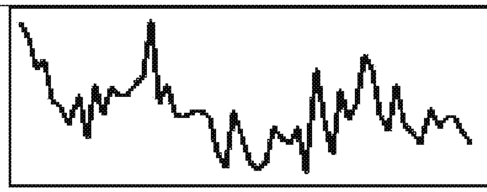
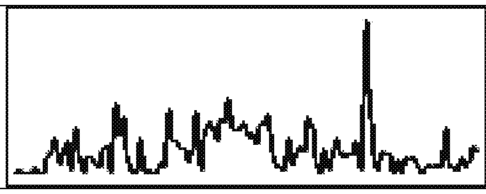
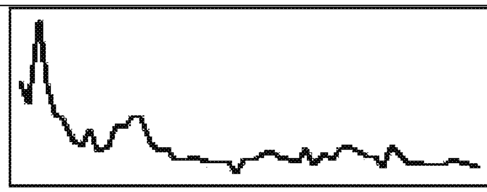
Particulate lead was released with particulate iron and manganese in the lead test chamber. Particulate aluminum followed a different pattern and was also very low. Iron and manganese trended together in the system water.

Parameter	Sparkline	
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water

Particulate lead and copper were similar in release patterns.

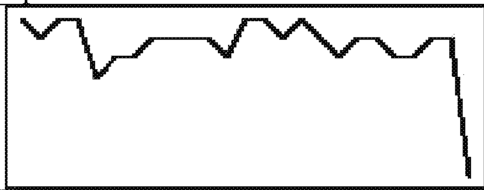
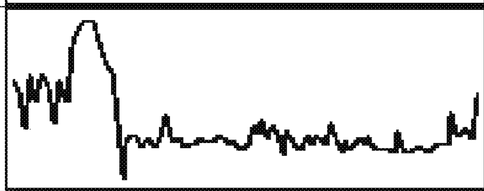
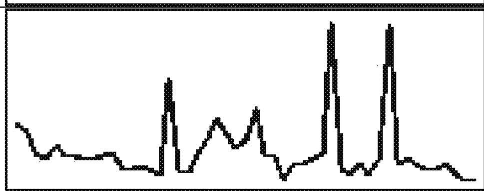
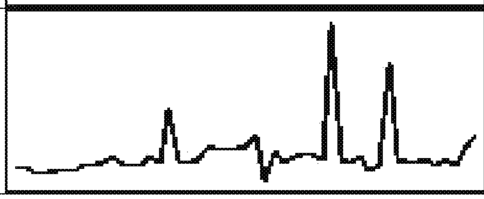
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

No common patterns were seen with nutrients and dissolved lead and copper release.

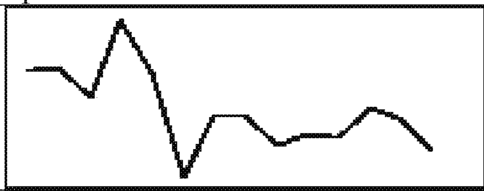
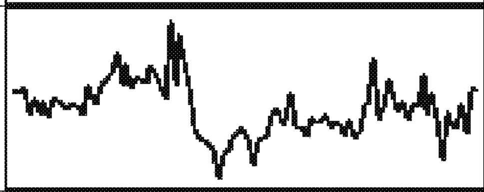
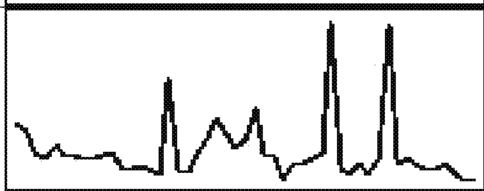
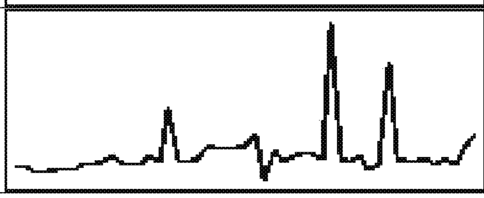
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

There was correlation between microbiological population and dissolved lead and copper release in that the population started high and dropped to a lower general level. The microbiological population showed a second small increase later in monitoring period. Dissolved lead and copper release slightly increased at the same time.

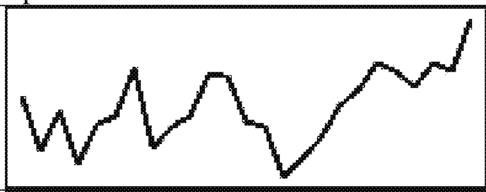
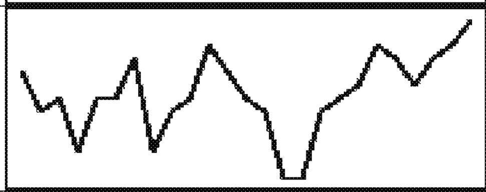
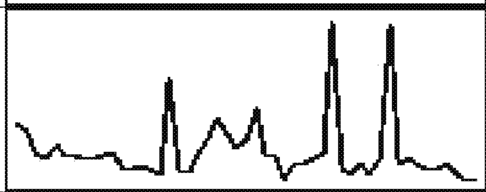
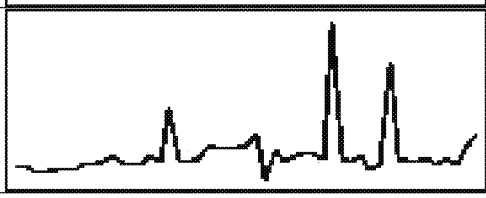
WATER SYSTEM H1

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

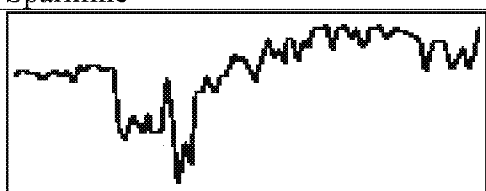
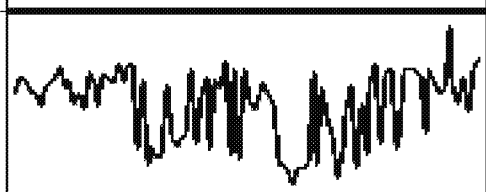
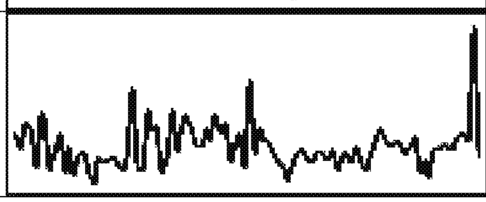
There were no common trends between alkalinity, pH, and dissolved lead and copper release. Dissolved lead release was similar to dissolved copper release.

Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

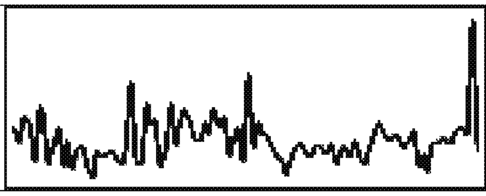
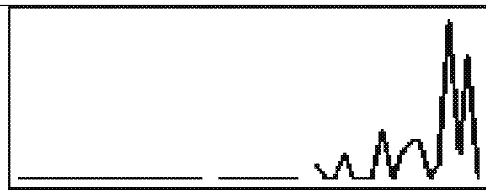
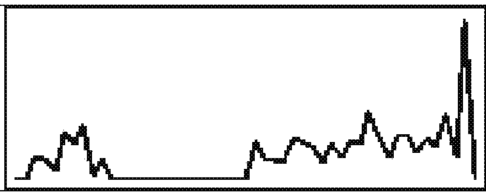
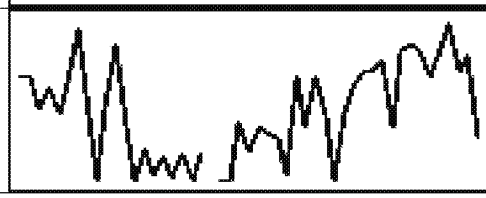
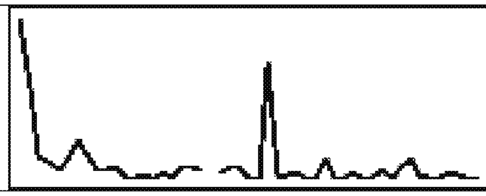
There were no common trends between total phosphorus/orthophosphate and dissolved lead and copper release.

Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

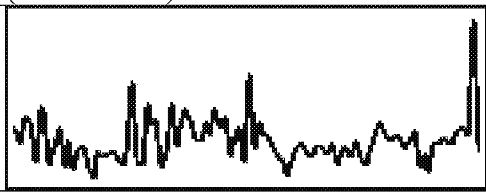
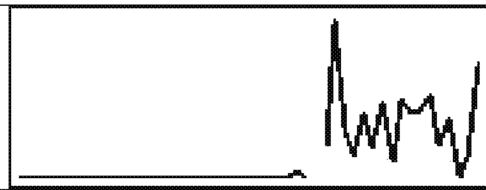
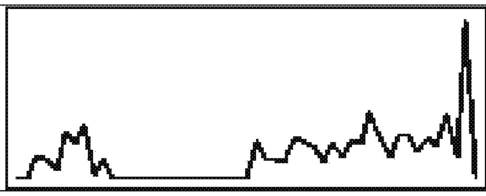
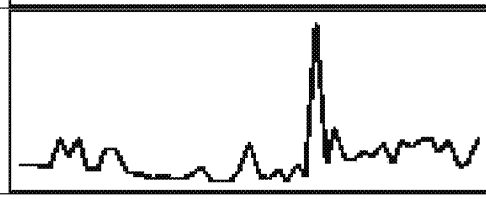
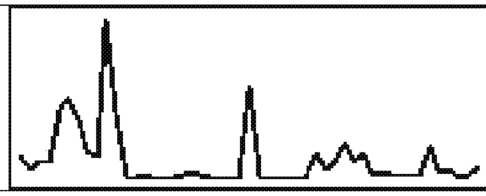
Chloride and sulfate trended together. They did not appear to trend with dissolved lead and copper release.

Parameter	Sparkline	
Oxidation/ reduction potential		in flowing water influent to the monitoring station
Conductivity		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station

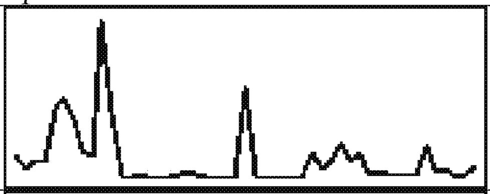
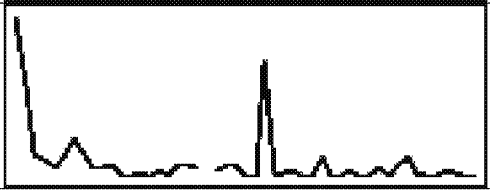
No common trends could be seen between ORP, conductivity, and turbidity.

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron	Near detection limit	
Manganese		
Aluminum	Near detection limit	Near detection limit
Copper		

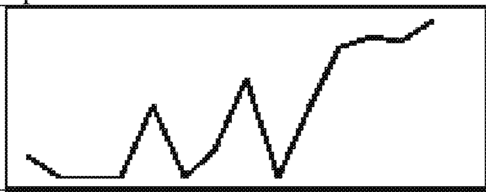
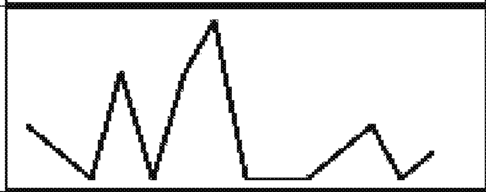
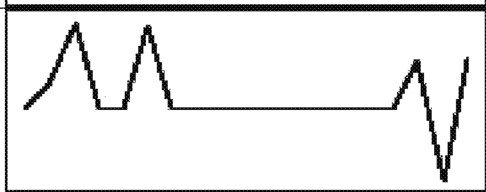
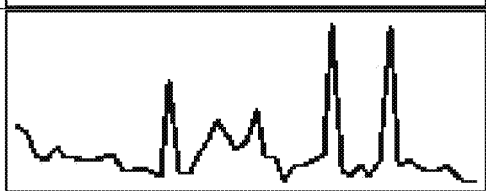
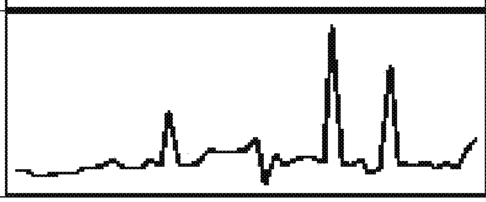
Trends could not be determined between particulate iron and manganese and particulate copper release.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron	Near detection limit	
Manganese		
Aluminum	Near detection limit	Near detection limit
Lead		

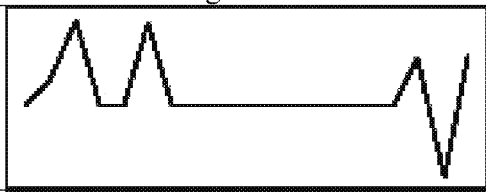
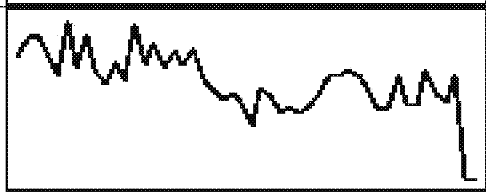
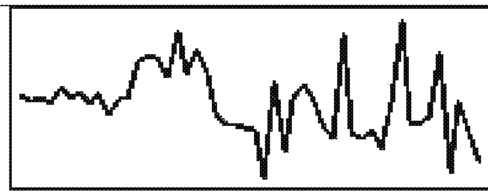
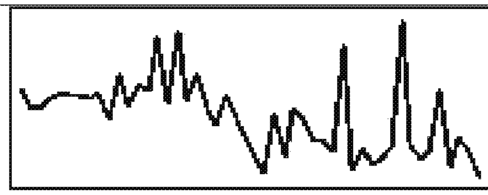
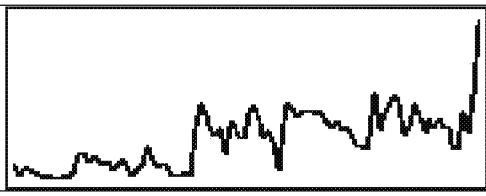
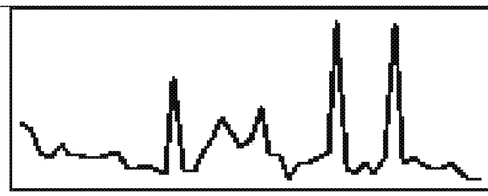
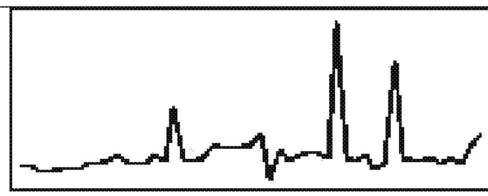
There were possible trends between particulate lead release and particulate iron and manganese.

Parameter	Sparkline	
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water

Particulate lead release appeared to be similar to particulate copper release.

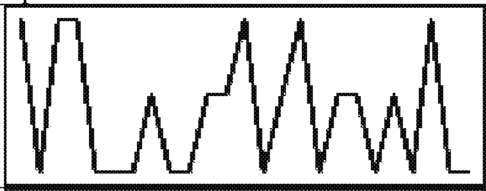
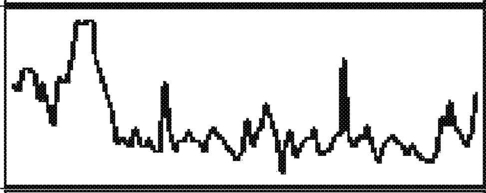
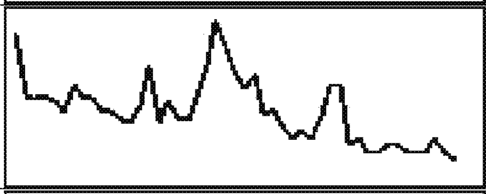
Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Nitrite/nitrate trended oppositely to dissolved organic carbon. The nutrients did not appear to trend with dissolved lead and dissolved copper release.

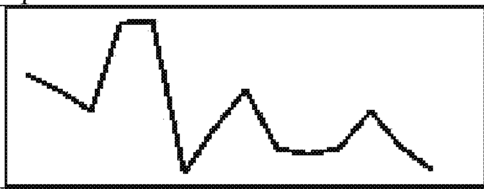
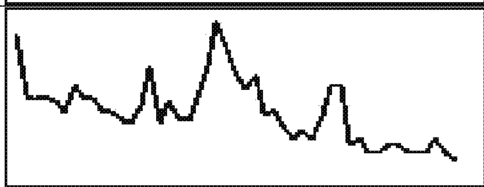
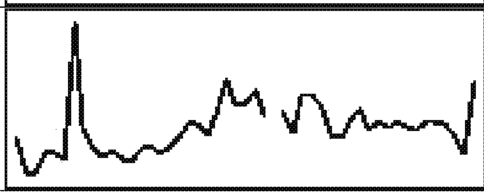
Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

Dissolved lead and dissolved copper release trended with microbiological populations in their test chambers. Disinfection increased as microbiological population dropped.

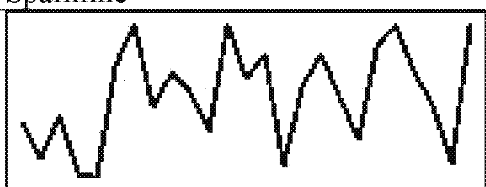
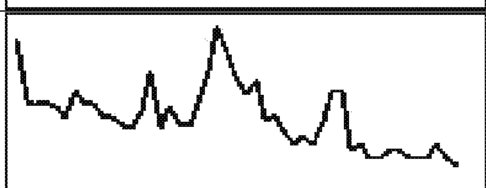
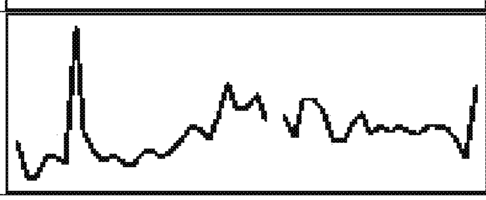
WATER SYSTEM H2

Parameter	Sparkline	
Alkalinity		in flowing water influent to the monitoring station
pH		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

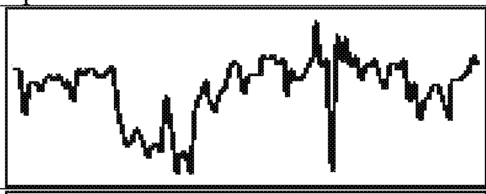
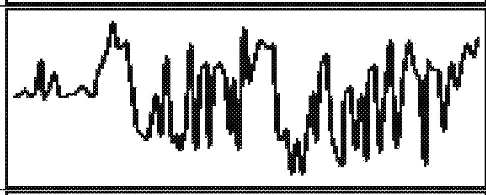
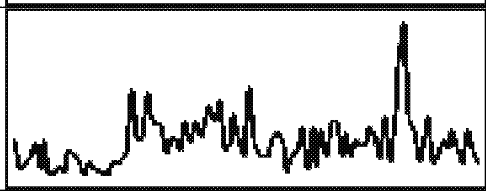
There were no common trends between alkalinity and pH and dissolved lead and dissolved copper release.

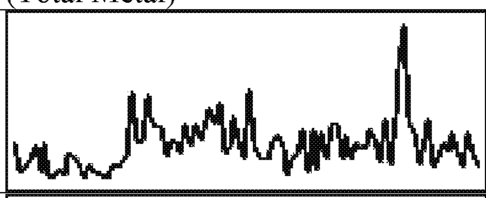
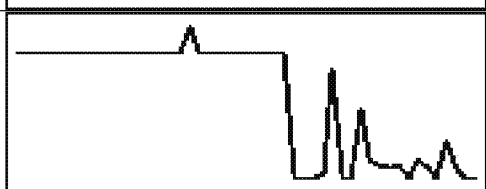
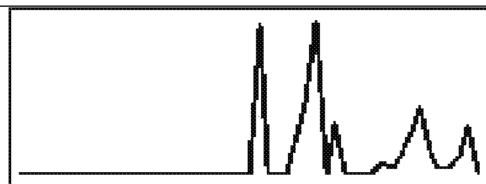
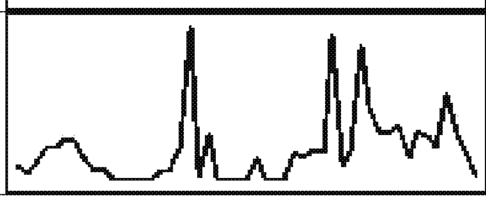
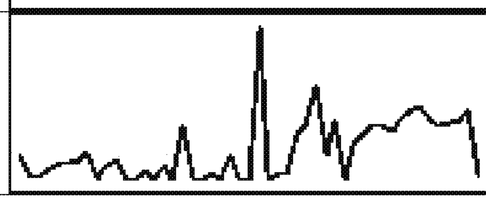
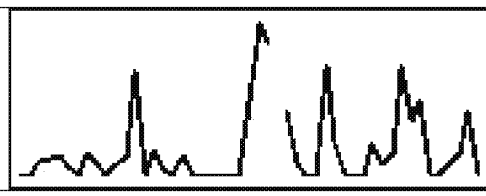
Parameter	Sparkline	
Total Phosphorus		in flowing water influent to the monitoring station
Ortho-phosphate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Dissolved copper and especially dissolved lead release trended inversely to orthophosphate.

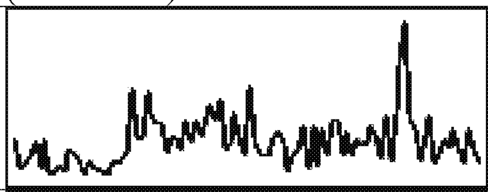
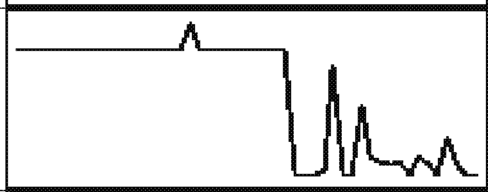
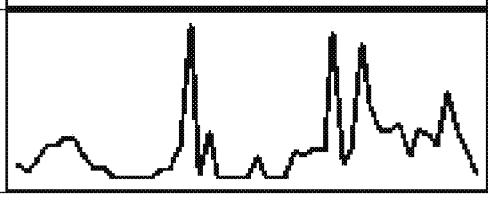
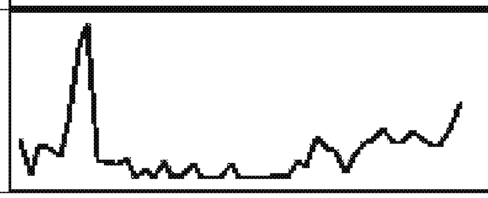
Parameter	Sparkline	
Chloride		in flowing water influent to the monitoring station
Sulfate		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Chloride and sulfate trended together but were not related to dissolved lead and copper release.

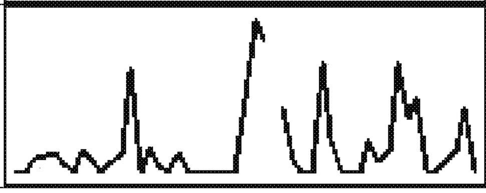
Parameter	Sparkline	
Oxidation/ reduction potential		in flowing water influent to the monitoring station
Conductivity		in flowing water influent to the monitoring station
Turbidity		in flowing water influent to the monitoring station

Parameter	Influent Flowing Water (Total Metal)	Copper Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Near detection limit	
Copper		

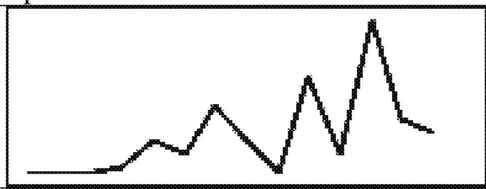
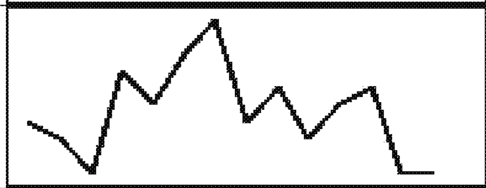
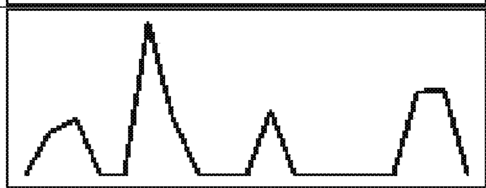
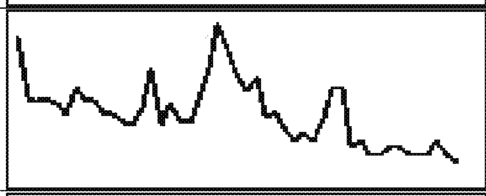
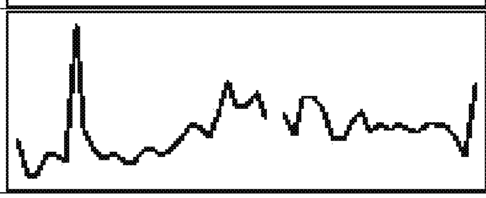
Particulate copper trended with particulate iron and manganese release.

Parameter	Influent Flowing Water (Total Metal)	Lead Test Chamber Stagnating Water (Particulate Metal)
Turbidity		
Iron		
Manganese		
Aluminum	Near detection limit	
Lead		

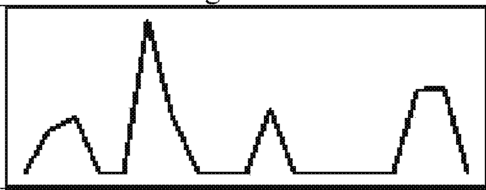
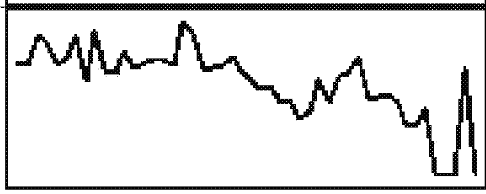
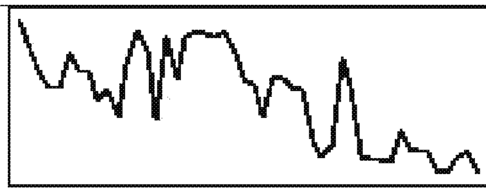
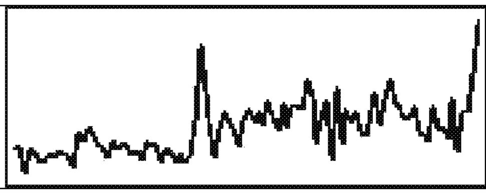
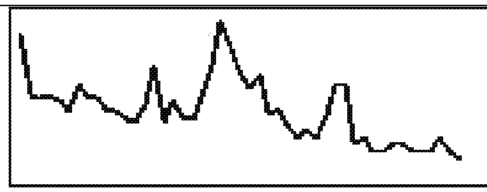
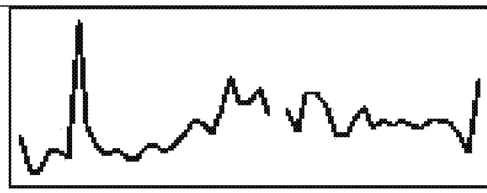
Particulate lead trended with particulate iron and manganese release.

Parameter	Sparkline	
Particulate Lead		in stagnating lead test chamber water
Particulate Copper		in stagnating copper test chamber water

Particulate lead and copper release were somewhat similar

Parameter	Sparkline	
Ammonia		in flowing water influent to the monitoring station
Nitrite/ Nitrate		in flowing water influent to the monitoring station
Dissolved Organic Carbon		in flowing water influent to the monitoring station
Dissolved Lead		in stagnating lead test chamber water
Dissolved Copper		in stagnating copper test chamber water

Dissolved lead and copper release did not trend with nutrients.

Parameter	Influent Flowing Water	Test Chamber Stagnating Water
Dissolved Organic Carbon		
Microbio-logical Population		 Lead Test Chamber
		 Copper Test Chamber
Disinfection		
Dissolved Lead		 Lead Test Chamber
Dissolved Copper		 Copper Test Chamber

Dissolved lead release trended with microbiological populations in the lead test chamber.

REFERENCES

APHA, AWWA, and WEF (American Public Health Association, American Water Works Association, and Water Environment Federation). 1995. *Standard Methods for the Examination of Water and Wastewater.* 19th Edition. Washington, D.C.: APHA.

AwwaRF and DVGW (American Water Works Association Research Foundation and DVGW-Technologiezentrum Wasser). 1996. *Internal Control of Water Distribution Systems.* 2nd ed. Project #725. Denver, Colo.: AwwaRF.

B&V (Black & Veatch). 2014. *WITAF Report (draft).* B&V Project No. 182074. Denver, Colo.: AWWA.

Bremer, P. J., B. J. Webster, and D. B. Wells. 2001. "Biocorrosion of Copper in Potable Water." *J. AWWA,* 93(8): 82-91.

Brown, R., N. McTigue, and D. Cornwell. 2015. *Controlling Lead in Drinking Water.* Project #4409. Denver, Colo.: Water Research Foundation.

Burlingame, G. A., D. A. Lytle, and V. L. Snoeyink. 2006. "Why Red Water? Understanding Iron Release in Distribution Systems." *Opflow,* 32(12): 12-16.

Cantor, A. F. 2006. "Diagnosing Corrosion Problems by Means of Metals Fractions." *J. AWWA* 98(1): 117-126.

Cantor, A. F. 2008. Pipe Loop on Steroids! A New Approach to Monitoring Distribution System Water Quality. In *Proceedings of the American Water Works Association 2008 Water Quality and Technology Conference.* Denver, Colo.: AWWA.

Cantor, A. F. 2009. *Water Distribution System Monitoring: A Practical Approach for Evaluating Drinking Water Quality.* Boca Raton, FL: CRC Press.

Cantor, A. F. 2010. Proactive Detection and Response to Lead and Copper in Drinking Water. In *Proceedings of the American Water Works Association 2010 Annual Conference and Exposition.* Denver, Colo.: AWWA.

Cantor, A. F. 2011. "The Lead and Copper Rule: Proactive Detection and Response Are Key to Compliance." *Opflow* 37(1): 14.

Cantor, A. F. 2014. Theoretical Lead and Copper Release into Drinking Water versus Reality. In *Proceedings of the American Water Works Association 2014 Water Quality and Technology Conference.* Denver, Colo.: AWWA.

Cantor, A. F., J. B. Bushman, and M. S. Glodoski. 2003b. A New Awareness of Copper Pipe Failures in Water Distribution Systems. In *Proceedings of the American Water Works Association 2003 Annual Conference and Exposition.* Denver, Colo.: AWWA.

Cantor, A. F., J. B. Bushman, M. S. Glodoski, E. Kiefer, R. Bersch, and H. Wallenkamp. 2006. "Copper Pipe Failure by Microbiologically Influenced Corrosion." *Materials Performance* 45(6): 38-41.

Cantor, A. F., and J. Cantor. 2009. In Dr. Deming's Footsteps: Distribution System Water Quality Control and Process Improvement. In *Proceedings of the American Water Works Association 2009 Water Quality and Technology Conference.* Denver, Colo.: AWWA.

Cantor, A. F., D. D. Chakroff, R. R. Vela, M. G. Oleinik, and D. L. Lynch. 2000. "Use of Polyphosphate in Corrosion Control." *J. AWWA* 92(2): 95-102.

Cantor, A. F., E. Kiefer, K. Little, A. Jacque, A. Degnan, J. B. Maynard, D. Mast, and J. Cantor. 2012. *Distribution System Water Quality Control Demonstration.* Project #4286. Denver, Colo.: Water Research Foundation.

Cantor, A. F., J. K. Park, and P. Vaiyavatjamai. 2003a. "Effect of Chlorine on Corrosion in Drinking Water Systems." *J. AWWA* 95(5): 112-123.
Code of Federal Regulations. 2010a. "Chapter 40 Protection of the Environment; Part 141 – National Primary Drinking Water Regulations; Subpart H – Filtration and Disinfection 141.72 Disinfection (a)(4)(i)." Washington, D.C.: U.S. Government Printing Office.
Code of Federal Regulations. 2010b. "Chapter 40 Protection of the Environment; Part 141 – National Primary Drinking Water Regulations; Subpart I – Control of Lead and Copper." Washington, D.C.: U.S. Government Printing Office.
Colling, J. H., B. T. Croll, P. A. E. Whincup, and C. Harward. 1992. "Plumbosolvency Effects and Control in Hard Waters." *Journal of the Institute of Water and Environment Management*; 6(6): 259-268.
Connell, G. F. 1996. *The Chlorination/Chloramination Handbook*. Denver, Colo.: AWWA.
Cornwell, D., and R. Brown (2015). *Evaluation of Lead Sampling Strategies.* Project #4569. Denver, Colo.: Water Research Foundation.
DeSantis, M. K., and M. R. Schock. 2014. Ground Truthing the Conventional Wisdom of Lead Corrosion Control Using Mineralogical Analysis. In *Proceedings of the AWWA Water Quality and Technology Conference*. Denver, Colo.: AWWA.
Duranceau, S. J., D. F. Newnham, J. Anselmo, and R. D. Teegarden. 1997. Implementation of Lead and Copper Corrosion Control Demonstration Test Programs for Three Florida Utilities. In *Proceedings AWWA Annual Conference*. Denver, Colo.: AWWA.
EES (Economic and Engineering Services, Inc.). 1990. *Lead Control Strategies*. Project #406. Denver, Colo.: AwwaRF and AWWA.
EPA (U.S. Environmental Protection Agency). 1993. *Method 365.1, Revision 2.0: Determination of Phosphorus by Semi-Automated Colorimetry.* Cincinnati, OH: EPA Office of Environmental Monitoring Systems Laboratory Office of Research and Development.
EPA (U.S. Environmental Protection Agency). 2010. *Nutrient Control Design Manual (EPA/600/R-10/100).* Washington, D.C.: EPA Office of Research and Development National Risk Management Laboratory Water Supply and Water Resources Division.
EPA (U.S. Environmental Protection Agency). 2016a. *Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primacy Agencies and Public Water Systems (EPA/816/B-16/003).* Washington, D.C.: EPA Office of Water.
EPA (U.S. Environmental Protection Agency). 2016b. *Lead and Copper Rule Revisions White Paper*. Washington, D.C.: EPA Office of Water.
Escobar, I. C., and A. A. Randall. 2001. "Ozonation and Distribution System Biostability." *J. AWWA* 93(10):77-89.
Gregory, R., and P. J. Jackson. 1984. Central Water Treatment to Reduce Lead Solubility. In *Proceedings AWWA Annual Conference*. Denver, Colo.: AWWA.
Hatch, G. B. 1941. "Inhibition of Lead Corrosion with Sodium Hexametaphosphate." *J. AWWA*, 33(7): 1179-1187.
Holm, T. R., and M. R. Schock. 1991. "Potential Effects of Polyphosphate Products on Lead Solubility in Plumbing Systems." *J. AWWA* 83(7): 76.
Larson, J. E. 1957. "Evaluation of the Use of Polyphosphates in the Water Industry." *J. AWWA,* 49(12): 1581-1586.
Larson, J. E., and R. V. Skold. 1958. *Laboratory Studies Relating Mineral Quality of Water to Corrosion of Steel and Caste Iron (Circular 71).* Urbana, IL: Illinois State Water Survey.

LeChevallier, M. W., O. D. Schneider, L. A. Weinrich, P. K. Jjemba, P. J. Evans, J. L. Hooper, and R. W. Chappell. 2015. *An Operational Definition of Biostability for Drinking Water*. Project #4312. Denver, Colo.: Water Research Foundation.

Lytle, D. A., and M. R. Schock. 2005. "Formation of Pb(IV) Oxides in Chlorinated Water." *J. AWWA,* 97(11): 102-114.

McFadden, M., R. Giani, P. Kwan, and S. H. Reiber. 2011. "Contributions to Drinking Water Lead from Galvanized Iron Corrosion Scales." *J. AWWA,* 103(4): 76-89.

Madigan, M. T., and J. M. Martinko. 2006. *Brock Biology of Microorganisms.* 11th Edition. Upper Saddle River, NJ: Prentice Hall.

Masten, S. J., S. H. Davies, and S. P. McElmurry. 2016. "Flint Water Crisis: What Happened and Why?" *J. AWWA,* 108(12): 22-34.

Nguyen, C. K., B. N. Clark, and M. A. Edwards. 2011. "Role of Chloride, Sulfate, and Alkalinity on Galvanic Lead Corrosion." *Corrosion*; 67(6): 065005-1 to 9.

Nguyen, C., K. Stone, B. Clark, M. Edwards, G. Gagnon, and A. Knowles. 2010. *Impact of Chloride: Sulfate Mass Ratio (CSMR) Changes on Lead Leaching in Potable Water.* Project #4088. Denver, Colo.: Water Research Foundation.

Peabody, A. W. 2001. *Control of Pipeline Corrosion.* 2nd ed. Houston, TX: National Association of Corrosion Engineers.

Rittmann. B. E., and P. L. McCarty 2001. *Environmental Biotechnology: Principles and Applications.* New York: McGraw-Hill.

Rogers, E. 2003. *Diffusion of Innovations.* 5th ed. New York: Simon and Schuster.

Rodgers, M. 2014. Impact of Corrosion Control on Publicly Owned Treatment Works. In *Proceedings of the 2014 AWWA Water Quality and Technology Conference*. Denver, Colo.: AWWA.

Roth, D. K., D. A. Cornwell, and R. A. Brown. 2016. "Copper Corrosion under the Lead and Copper Rule Long-Term Revisions." *J. AWWA,* 108(4): 56-61.

Sayers, D., W. Jernigan, G. Kunkel, and A. Chastain-Howley. 2016. "The Water Audit Data Initiative: Five Years and Accounting." *J. AWWA,* 108(11): E598-E605.

Schock, M. R. A. F. Cantor, S. Triantafyllidou, M. K. DeSantis, and K. G. Scheckel. 2014. "Importance of Pipe Deposits to Lead and Copper Rule Compliance." *J. AWWA,* 106(7): E336-E349.

Schock, M. R., and D. A. Lytle. 2011. "Internal Corrosion and Deposition Control." In *Water Quality and Treatment: A Handbook of Drinking Water*, 6th ed. Denver, Colo: American Water Works Association.

Schock, M. R. and D. A. Lytle. 2014. Demystifying Copper Corrosion. EPA presentation at the *New England Water Works Association 133rd Annual* Conference, Rockeland, ME.

Sheiham, I., and P. J. Jackson. 1981. "The Scientific Basis for Control of Lead in Drinking Water by Water Treatment." *Journal of the Institute of Water Engineers and Scientists,* 35(6): 491-515.

Tanyi, A. O. 2006. *Comparison of Chemical and Biological Phosphorus Removal in Wastewater – A Modelling Approach.* Scania, Sweden: Lund University Department of Chemical Engineering.

Tetra Tech and AWWA (American Water Works Association). 2011. *Tetra Tech (RTW) Model for Water Chemistry, Process, and Corrosion Control.* Denver, Colo.: AWWA.

Van der Kooij, D. 1992. "Assimilable Organic Carbon as Indicator of Bacterial Regrowth." *J. AWWA,* 84(2): 57.

Verburg, S. 2016. *Years before Flint's Scandal, Madison Did Unusual, Costly Lead Pipe Fix. Wisconsin State Journal.* Jan. 31, 2016.

Volk, C. J., and M. W. LeChevallier. 2000. "Assessing Biodegradable Organic Matter." *J. AWWA,* 92(5): 64.

Wagner, I. 1989. Effect of Inhibitors on Corrosion Rate and Metal Uptake in Drinking Water Systems. In *Proceedings AWWA Annual Conference.* Denver, Colo.: AWWA.

Wheeler, D. J., and D. S. Chambers. 1992. *Understanding Statistical Process Control.* 2nd ed. Knoxville, TN: SPC Press.

WDNR (Wisconsin Department of Natural Resources). 2012. *Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges.* Madison: WDNR.

WDOA and WDNR (Wisconsin Department of Administration and Wisconsin Department of Natural Resources). 2015. *Substantial and Widespread Adverse Social and Economic Impacts of Wisconsin's Phosphorus Regulations – A Preliminary Determination* (Draft). Madison: WDOA and WDNR.

Zhang, M., M. J. Semmens, D. Schuler, and R. M. Hozalski. 2002. "Biostability and Microbiological Quality in a Chloraminated Distribution System." *J. AWWA,* 94(9): 112.

ABBREVIATIONS

ATP	Adenosine triphosphate
CSMR	Chloride to sulfate mass ratio
DOC	Dissolved organic carbon
EPA	U.S. Environmental Protection Agency
LCL	Lower control limit
LCR	Lead and Copper Rule
LOD	Limit of detection
NPDES	National Pollution Discharge Elimination System
ORP	Oxidation Reduction Potential
PRS	Process Research Solutions
TCR	Total Coliform Rule
TMDL	Total Maximum Daily Load
UCL	Upper control limit
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System
WPSC	Wisconsin Public Service Commission
WWTF	Wastewater treatment facility

Message

From: Helm, Erik [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6770EF5BB04224A198D70B5988B765-EHELM]
Sent: 9/5/2018 6:44:14 PM
To: Roberson, Alan [aroberson@asdwa.org]
CC: Goldberg, Michael [Goldberg.Michael@epa.gov]
Subject: Notes from out August 16 meeting
Attachments: Notes from ASDWA Meeting 081618 MG eh 9-5-18 V2.docx

Alan,

Attached are draft meting notes from our August 16 meeting with you and the ASDWA Board, prepared by Mike Goldberg. We are preparing these for inclusion in our rule record. Could you please take a look to make sure we captured everything correctly. Also could you pay particular attention to attachment 3, the attendees list. We don't have a complete list of ASDWA attendees. We included the list of people from the meeting invite, but we are not sure if certain ASDWA members did not attend. Let me know if you see anything else that may not have been captured correctly.

erik

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Meeting Notes from Association of State Drinking Water Administrators (ASDWA) Discussion of their Proposed Regulatory Construct for the Lead and Copper Rule (LCR) Long-Term Revisions (LTR)

Thursday, August 16, 2018

11:30-12:30

Prior to the August 16, 2018 meeting, EPA provided ASDWA a list of questions (Attachment 1) and excerpts from ASDWA's Federalism consultation comments (originally provided to EPA in March 2018, Attachment 2). These materials were designed to focus the meeting on a specific part of the ASDWA comments, regarding the "**Strengthened Regulatory Framework Using "Bins,"** where EPA wanted further clarification and understanding. During the meeting the EPA reviewed the list of questions and ASDWA board members and staff provided their additional thoughts on the initial Federalism comments. Attachment 3 provides a list of meeting attendees.

The text below provides a general summary of the discussion, it is not a direct quotation.

1. Is there technical basis (health or technology based) for the selection of the potential action levels associated with bins #2 (5 ppb) # 3 (10 ppb)?
    - ASDWA Response: There is no technical or health-based rationale behind the selection of bin thresholds. The goal was to construct a logical, stepwise approach leading up the 15 ppb action level. By having corrective actions planned below 15 ppb there would be a chance for improved public health.
2. The framework describes triggering requirements for preparatory actions like developing CCT plans developing LSLR plans and conducting WQP assessments at lower 90th percentile values than currently trigger actions for small system. Is it the states experience that for most of these systems 90th percentile lead levels will increase gradually over time? What about the systems that have 90th percentile values that are relatively consistent? For example, does ASDWA believe that systems should take a preparatory actions even if they have a history of 90th percentiles consistently between 5 and 10?
    - ASDWA Response: The actions in Bins #2 and #3 are preparatory in nature, meaning the system can quickly start the rule requirements should it get triggered into a higher bin. ASDWA believed that the actions they wrote in their Bins #2 and #3 construct were not stringent enough, and could have been stricter.
3. We have observed from historical LCR 90th percentile data that systems may also have significant variations between monitoring periods such that their 90th percentile levels may go up or down by more than an increment of 5 ppb which under the Framework could result in systems being placed into a higher or lower bin every six months or year. How do the states envision managing the transitions of systems between bins? Given that actions required in the bins may take more than a 6 months or a year to complete, what would states envision happens to requirements like CCT plans that may not be completed when a systems 90th percentile drops enough so that it is no longer a Bin 2 system?

- ASDWA Response: ASDWA believes that the 90th percentile concentrations under the LTR will differ from historical concentrations due to updated sampling locations and the closing of loopholes. The variability of 90th percentile concentrations over time, however, is unknown.
- ASDWA Response: It might make sense to move to the lower bin after two monitoring periods demonstrate lower lead levels. EPA could use language like lead concentrations are reliably and consistently below a bin threshold.
- ASDWA Response: It is important not to have requirements start and stop repeatedly. Requirements that impact water quality like CCT once triggered and implemented should remain in place regardless of future 90th percentile concentrations. Other bin requirements could be removed when a system drops to a lower bin, which would be an incentive for systems to improve their water quality.

4. Could you describe the components of the LSLR plan to be developed in bin 2? How long would systems have to develop the plan, will there be required removal targets, and will all size system in bin 2 be required to develop a plan?
   - ASDWA Response: The LSLR Plan would include the LSLR goal rate, cost and budget planning, standard operating procedures, steps on how to notify the homeowner, and understanding who will do the work (contractors or in-house labor).
5. Describe how the LSLR pilot would work and what is the goal of the pilot? How long would systems have to implement the pilot?
   - ASDWA Response: The pilot would ground truth the systems cost estimates and could be done in coordination with an emergency repair of a service line.
6. What does the voluntary LSLR program entail in bin 3?
   - ASDWA Response: It is difficult to designate a LSLR rate, even a minimum rate, in a voluntary program. The public pressure to proactively remove LSLs along with public education to the community could incentivize a system to voluntarily replace LSLs. But under a voluntary program states could not force a system to remove LSLs.
7. In bin 4 after an ALE is a mandatory LSLR program envisioned? What replacement rate should be required?
   - ASDWA Response: ASDWA supports a national LSLR rate, that would provide consistency. Otherwise, systems would be underachieving what they could actually do. This would apply to full LSLR, not partials.
8. If a system's WQ improves how long should a system that was in bin 4 still conduct their required LSLR program? The same question applies to the voluntary program in bin 3 and may apply to the study and pilot in bin 2.
   - ASDWA Response: The rule should require a set percentage or number of LSLR before the system can drop into a lower bin. If system enters a new year still in bin 4 an annual replacement rate is triggered that must be completed even if 6-month monitoring drops the system out of bin 4 before the end of the year. It is important to remove the sources of lead in the system because even with CCT in place events like freezing in a systems distribution pipes can release lead.

9. Given the limitations of the smallest water systems, what are states thoughts with respect to point of use treatment as alternatives to corrosion control treatment and or lead service line replacement?
    - ASDWA Response: There is a patchwork of state laws regarding the use of POU for small system compliance. Pennsylvania does not allow it. Other states like Idaho, North Dakota, and Nevada only allow POUs if an association can compel 100% participation and full access rights to change filters periodically. Without these provisions, it is difficult to get full participation. Nevertheless, although this compliance option is not commonly used, its inclusion in the LTR would be beneficial for the few systems that might use it.

ATTACHMENT 1: Questions Sent to ASDWA on August 15 Prior to August 16 Meeting

Questions for ASDWA regarding the "**Strengthened Regulatory Framework Using "Bins"** from their March 2018 Federalism Input (attached)

1. Is there technical basis (health or technology based) for the selection of the potential action levels associated with bins #2 (5 ppb) # 3 (10 ppb)?
2. The framework describes triggering requirements for preparatory actions like developing CCT plans developing LSLR plans and conducting WQP assessments at lower 90th percentile values than currently trigger actions for small system. Is it the states experience that for most of these systems 90th percentile lead levels will increase gradually over time? What about the systems that have 90th percentile values that are relatively consistent? For example, does ASDWA believe that systems should take preparatory actions even if they have a history of 90th percentiles consistently between 5 and 10?
3. We have observed from historical LCR 90th percentile data that systems may also have significant variations between monitoring periods such that their 90th percentile levels may go up or down by more than an increment of 5 ppb which under the Framework could result in systems being placed into a higher or lower bin every six months or year. How do the states envision managing the transitions of systems between bins? Given that actions required in the bins may take more than 6 months or a year to complete, what would states envision happens to requirements like CCT plans that may not be completed when a system's 90th percentile drops enough so that it is no longer a Bin 2 system?
4. Could you describe the components of the LSLR plan to be developed in bin 2? How long would systems have to develop the plan, will there be required removal targets, and will all size system in bin 2 be required to develop a plan?
5. Describe how the LSLR pilot would work and what is the goal of the pilot? How long would systems have to implement the pilot?
6. What does the voluntary LSLR program entail in bin 3?
7. In bin 4 after an ALE is a mandatory LSLR program envisioned? What replacement rate should be required?
8. If a system's WQ improves how long should a system that was in bin 4 still conduct their required LSLR program? The same question applies to the voluntary program in bin 3 and may apply to the study and pilot in bin 2.
9. Given the limitations of the smallest water systems, what are states thoughts with respect to point of use treatment as alternatives to corrosion control treatment and or lead service line replacement?

ATTACHMENT 2: Excerpt from ASDWA's March 8, 2018 Federalism Input on Long Term Revisions to the Lead and Copper Rule Sent to ASDWA on August 15 Prior to August 16 Meeting

Strengthened Regulatory Framework Using "Bins" Targets Additional Requirements
The LCR Federalism Consultation approach posed some challenges for ASDWA's members (as co-regulators with EPA) in developing substantive comments. As previously mentioned, the current LCR is probably the most complex drinking water regulation with lots of moving parts, and many potential regulatory changes have been discussed and debated for the past 15-20 years.

EPA presented questions on five topics at the initial [HYPERLINK "https://www.epa.gov/sites/production/files/2018-01/documents/eo_13132_federalism_consultation_presentation-final_1.9.2018.pdf"] [HYPERLINK "https://www.epa.gov/sites/production/files/2018-01/documents/eo_13132_federalism_consultation_presentation-final_1.9.2018.pdf"]. The challenge ASDWA faced was how to connect the topics together in a holistic regulatory framework that shows how each builds and integrates with the other. ASDWA's Board of Directors met this challenge by developing a progressively more stringent regulatory framework based on increasing levels of the 90th percentile of lead samples for 1-liter first draw tap samples. The framework fits the pieces of the regulatory "jigsaw puzzle" together into a holistic approach and targets more stringent regulatory treatment technique requirements where they are needed most. The "bins" regulatory framework is detailed below.

Bin	Lead 90th percentile	Corrosion Control Treatment (CCT)	Lead Service Lines (LSLs)	Water Quality Parameters (WQPs)	PE and Outreach Materials	Tap Sampling
#1	0-5.0 µg/L	Retain current requirements for triggering installation of CCT	Retain current requirements for triggering LSL replacement (LSLR)	Retain current requirements for WQP monitoring for systems with CCT	Provide public education (PE) in Consumer Confidence Report (CCR) & other delivery channels	Retain frequency & triggers in current rule. Allow triennial monitoring
#2	5.0-10.0	Retain current requirements for triggering installation of CCT	Develop LSLR plan & pilot LSLR plan	WQP assessment to evaluate changes in water chemistry	Deliver targeted PE for homes with LSLs	Annual monitoring with standard number of sites. No triennial monitoring

#3	10.0-15.0	Require CCT study that identifies appropriate CCT if Action Level (AL) is exceeded – Implement distribution system find & fix protocol	Implement proactive voluntary LSLR	Increase frequency and number of sampling sites for WQP monitoring. Recommend optimal WQP ranges as part of CCT study	Deliver targeted PE to areas of distribution system based on find and fix	Monitor every six months
#4	>15.0 µg/L	Require CCT	Require implementation of LSLR plan	Require WQP monitoring based on CCT	Deliver broader PE and outreach materials for all	Monitor every six months

Each bin builds upon the previous bin. For example, a system in bin #2 must comply with the regulatory requirements in both bins #1 and #2. A system in bin #3 must comply with the regulatory requirements in bins #1, #2, and #3. A system in bin #4 must comply with all the requirements in all bins.

This framework eliminates several "loopholes" in the current rent. For example, water systems would not be able to sample repeatedly at sites with low lead levels to reduce their 90th percentile. Systems would not be able to sample from sub-optimal sites based on outdated information, i.e.,
for systems with a blend of LSL and non-LSL homes, all compliance sampling locations would need to be at LSL homes.

This framework also has some details that warrant further discussions and deliberations. For example, some of the above components will need an "anti-backsliding" approach, such as corrosion control treatment (CCT). Once CCT is initiated, it should be considered a permanent installation and not suspended when 90th percentiles decline. Further discussion between EPA and ASDWA (as co-regulators) is also needed on how much existing data (grandfathering) could be used for initial bin placement.

This regulatory framework parallels other NPDWRs, such as the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and prioritizes regulatory actions for systems that have higher 90th percentiles, thereby increasing public health protection in a timely manner. It also recognizes and allows water systems in the lowest bin (bin #1 with a 90th percentile of 0-5.0
µg/L) to maintain their present actions. Water systems in the lowest bin would not be required to make the investment to replace lead service lines (LSLs) when the inherent water chemistry or corrosion control is working and a sufficient scale inside the pipe has been formed to minimize lead exposure. The framework is proactive in that if a system is in bin #3 (10.0-15.0 µg/L), steps will be required that would hopefully prevent the systems from exceeding the 15 µg/L Action Level (AL). Finally, this framework encourages systems to strive for a lower bin with less regulatory requirements that would ultimately lead to increased public health protection.

The assessment in bin #2 should include an evaluation of more frequent lead and water quality parameter (WQP) monitoring, the WQP operational range, more representative locations, the potential need for additional WQP parameters such as dissolved inorganic carbon (DIC), etc. ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed assessment.

The broader public education and outreach effort in bin #4 should include increased frequency, targeted delivery, good faith effort to reach renters, and partnerships with schools and day care centers and local health agencies. Again, ASDWA would be willing to collaborate with EPA on the development of guidance on the details of this proposed outreach effort. The [HYPERLINK "https://www.lslr-collaborative.org/"] [HYPERLINK "https://www.lslr-collaborative.org/"] of which ASDWA is a member, would provide a forum for development and distribution of the broader public education and outreach materials.
Additionally, EPA needs to take the lead with all federal agencies in reducing total lead exposure and the distribution of such materials to others that need them besides states and water systems, such as the Department of Education for schools and the Department of Health and Human Services (HHS) for childcare facilities and local health agencies.

ATTACHMENT 3: Attendee List

- Eric Burneson, EPA
- Lisa Christ, EPA
- Erik Helm, EPA
- Michael Goldberg, EPA
- Alan Roberson, ASDWA
- Wendi Wilkes, ASDWA
- Cathy Tucker-Vogel, Kansas
- Bridget O'Grady, ASDWA
- Steve Elmore, Wisconsin
- Yvette Depeiza, Massachusetts
- Mark Mayer, South Dakota
- My-Linh Nguyen, Nevada
- Doug Kinard, South Carolina
- Stephanie Stringer, New Mexico
- Darrel Osterhoudt, ASDWA
- Jerry Henry, Idaho
- Anthony DeRosa, ASDWA
- Patrick Murphy, West Virginia
- Greg Warva, North Dakota
- Deidre Mason, ASDWA
- Roger Sokol, New York
- Kevin Letterly, ASDWA
- Lisa Daniels, Pennsylvania

Message

From: Helm, Erik [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6770EF5BB04224A198D70B5988B765-EHELM]
Sent: 3/12/2018 11:15:33 AM
To: Roberson, Alan [aroberson@asdwa.org]
CC: dosterhoudt@asdwa.org
Subject: RE: the importance of public education and LSL replacement

Thanks on both counts.

erik

Erik C. Helm, Ph.D.
Senior Economist
U.S. Environmental Protection Agency
OW, OGWDW, SRMD,
Targeting and Analysis Branch
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Mailcode 4607M
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
Physical Address (Package Delivery):
Room 2227N
1201 Constitution Avenue, N.W.
Washington, D.C. 20004
E-mail: Helm.Erik@epa.gov
Ph: 202-566-1049
Fax: 202-564-3760

From: Roberson, Alan [mailto:aroberson@asdwa.org]
Sent: Friday, March 09, 2018 11:42 AM
To: Helm, Erik <Helm.Erik@epa.gov>
Cc: dosterhoudt@asdwa.org
Subject: Re: the importance of public education and LSL replacement

Erik, more not-so-good news on the data front as I talked with Darrell and we don't have the data that you need. That being said, at some point down the road, maybe the three of us can meet and talk about your data needs as I am willing to go out to the states once with a survey.

Not sure if these have trickled down to you yet, but enclosed are our LCR comments that were submitted yesterday. Alan

On Thu, Mar 8, 2018 at 3:08 PM, Helm, Erik <Helm.Erik@epa.gov> wrote:

> Thanks Alan,
>
> I did ask Steve as well, if anything new comes to mind let me know.

By the way would you know if any of your states have collected data on the number or percent of LSLR under the current rule's action level exceedance 7% LSL replacement requirements, are actually "test outs"?

erik

Erik C. Helm, Ph.D.
Senior Economist
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Washington, D.C. 20004
E-mail: Helm.Erik@epa.gov
Ph: 202-566-1049
Fax: 202-564-3760

From: Roberson, Alan [mailto:aroberson@asdwa.org]
Sent: Thursday, March 08, 2018 2:53 PM
To: Helm, Erik <Helm.Erik@epa.gov>
Cc: dosterhoudt@asdwa.org
Subject: Re: the importance of public education and LSL replacement

Erik, I can honestly say I don't know of any data that might help you out. That being said, I think Steve Via from AWWA (who I have cc'ed on this message) might be able to steer you to 9 water systems that are working hard on voluntary LSLR. I know a few now:

- Boston Water & Sewer Commission
- Cincinnati Water Works
- Maybe Philadelphia Water
- Maybe American Water

Steve is going to be at our Member Meeting on Monday so I can chat with him about this issue a bit...

Alan

On Wed, Mar 7, 2018 at 1:36 PM, Helm, Erik <Helm.Erik@epa.gov> wrote:

Alan and Darrell,

As part of the analysis of benefits and for that matter the timelines for regulatory compliance under LCR regulatory options, I have started thinking about how you would quantify the change in LSLR that results from the increases in public education. I'm trying to basically figure out how affective PE is at changing people's behavior with lead service line replacement. This would help in general with determining the benefits of requiring new PE, and it would also help with the analysis of the NDWAC recommendations for an LSLR program that triggers PE when goals are not met.

Has ASDWA or any states collected quantitative information of PE metrics like the number of times households are contacted under the LCR rule or voluntary LSLR programs and homeowners willingness to pay for the private side replacement? Or could you point me to a number of systems (no more than 9) that are currently engaged in a voluntary LSLR program, so I might collect data across those systems and look at their variation to determine some sort of relationship.

Thanks very much for your assistance. Please any thoughts you have on the topic would be appreciated.

Erik

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Senior Economist
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Ph: 202-566-1049
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Executive Director

Association of State Drinking Water Administrators (ASDWA)
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Message

From:	Helm, Erik [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8C6770EF5BB04224A198D70B5988B765-EHELM]
Sent:	3/8/2018 8:08:14 PM
To:	Roberson, Alan [aroberson@asdwa.org]
CC:	dosterhoudt@asdwa.org
Subject:	RE: the importance of public education and LSL replacement

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Sent: Thursday, March 08, 2018 2:53 PM
To: Helm, Erik <Helm.Erik@epa.gov>
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Subject: Re: the importance of public education and LSL replacement

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Message

From: Jonathan Davis [jdavis@csg.org]
Sent: 1/28/2020 10:06:10 PM
To: Kempic, Jeffrey [Kempic.Jeffrey@epa.gov]
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Okay. That should work out just fine.

Jon

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Tuesday, January 28, 2020 3:26 PM
To: Jonathan Davis <jdavis@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

I have attached the big slide deck. I did this set of slides at AWWA WQTC in November in an hour time slot and covered the slides in under 40 minutes as I skipped a bunch of the introduction slides in that talk as well. I think this should work for Monday.

Jeff

From: Jonathan Davis <jdavis@csg.org>
Sent: Tuesday, January 28, 2020 2:09 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Probably somewhere between 17 and 45 slides. Since you're the sole presenter, you'll have 40 minutes available, so we're that provide a bit of overview before delving into the policy-related issues upon which our legislators are likely to focus – including action levels, the new trigger level, replacement of lead service lines, reporting requirements, funding, lead in schools and daycare facilities – without getting into the weeds in technical detail. If it would help to further talk by phone, I'm available all afternoon.

Jon

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Tuesday, January 28, 2020 10:49 AM
To: Jonathan Davis <jdavis@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

I am trying to decide between the short overview presentation (about 17 slides) or the more detailed, which includes the overview (which I would mostly skip) and discusses in detail the proposed requirements (total of 45 slides, with 15 I would probably skip). Which slide deck do you think would be the appropriate one for Monday? Let me know when you get a chance. Thanks.

Jeff

From: Jonathan Davis <jdavis@csg.org>
Sent: Thursday, January 23, 2020 4:32 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Great news, and thanks. I'll look forward to the webinar.

Jon

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Thursday, January 23, 2020 3:07 PM
To: Jonathan Davis <jdavis@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

Yes, I am available to proceed on Monday Feb 3. I will get you the picture and slides next week. Thanks.

Jeff

From: Jonathan Davis <jdavis@csg.org>
Sent: Tuesday, January 21, 2020 10:29 AM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Subject: FW: Invitation to present in a webinar on the LCR

Jeff,

Per my voice message, I'm following up on my email from Jan. 6 (below). Are you available to proceed on the morning of Monday, Feb. 3?

Thanks,

Jon Davis | Policy Analyst | Assistant Editor
The Council of State Governments, Midwestern Office
701 East 22nd Street, Suite 110 | Lombard, IL 60148
phone: 630.925.1922
www.csgmidwest.org

From: Jonathan Davis
Sent: Monday, January 6, 2020 4:23 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Thanks for the heads-up about the extension. Let's go ahead with Feb. 3 for the webinar; we can devote the entire call to the LCR. Our members will be more interested in the policy details rather than the technical ones, so we're anticipating that we won't need a great deal of time needed for Q&A, since they'll need some time to process what they're going to hear. Can that fit into 30 minutes or will you need/want more time?

Can you please send us an image – preferably 300 dpi or better -- and also a title? And, so we can share the slidedeck in advance, can you please get your slides to me by Thursday, Jan. 30?

Thank you again for your assistance.

Sincerely,

Jon Davis | Policy Analyst | Assistant Editor
The Council of State Governments, Midwestern Office
701 East 22nd Street, Suite 110 | Lombard, IL 60148
phone: 630.925.1922
www.csgmidwest.org

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Monday, January 6, 2020 1:27 PM
To: Jonathan Davis <jdavis@csg.org>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

That should work – the comment period was extended until February 12, 2020 recently:

https://www.federalregister.gov/documents/2019/12/19/2019-27282/national-primary-drinking-water-regulations-lead-and-copper-rule-revisions

The February 3date would still be within the comment period for the rule. You may want to allow more time as it may be tight to go over the proposed rule requirements and have a Q&A in all of those key areas of the proposed rule.

Hope that helps.

Jeff

Jeffrey Kempic
Treatment Technology and Cost Team Leader
Standards and Risk Management Division
Phone: (202) 564-4880

From: Jonathan Davis <jdavis@csg.org>
Sent: Friday, January 03, 2020 3:11 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Thank you for your reply. It's a bit too late for Monday the 6th, but we would like to schedule you for a webinar on the LCR, even if it's after the comment period closes.

The Caucus' Task Force on Lead has a conference call scheduled on Monday, Feb. 3 at 8:30 a.m. CST/9:30 a.m. EST – might you be available then? We envision about a 30 minute presentation plus Q&A, on topics including action levels, new trigger level, replacement of lead service lines, reporting requirements, funding, lead in schools and daycare facilities. Does this seem doable, or should we allow more time? And are there any elements of the new LCR that we're missing?

Thank you again for your assistance and willingness to present to the Caucus.

Sincerely,

Jon Davis | Policy Analyst | Assistant Editor
The Council of State Governments, Midwestern Office
701 East 22nd Street, Suite 110 | Lombard, IL 60148
phone: 630.925.1922
www.csgmidwest.org

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Friday, January 3, 2020 9:56 AM
To: Jonathan Davis <jdavis@csg.org>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

I was on leave until yesterday and did not get approval to possibly do the webinar until this morning. I am available on Monday, but not next Friday. Do you still want to try to do the webinar given the short lead time? If so, let me know so we can discuss the details and what your members are interested in regarding the lead and copper rule. Thanks.

Jeff

Jeffrey Kempic
Treatment Technology and Cost Team Leader
Standards and Risk Management Division
Phone: (202) 564-4880

From: Jonathan Davis <jdavis@csg.org>
Sent: Monday, December 30, 2019 12:21 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: Invitation to present in a webinar on the LCR
Importance: High

Mr. Kempic,

Per my phone message, the Great Lakes-St. Lawrence Legislative Caucus is hosting a webinar next week on revisions to the Lead and Copper Rule. Alan Walts recommended you to us as a potential presenter; would you be available either at 1 p.m. CST on Monday, Jan. 6, or 9 a.m. CST on Friday, Jan. 10?

Sincerely,

Jon Davis | Policy Analyst | Assistant Editor
The Council of State Governments, Midwestern Office
701 East 22nd Street, Suite 110 | Lombard, IL 60148

phone: 630.925.1922
www.csgmidwest.org

Message

From: Kempic, Jeffrey [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=274AE714CBD24F8F896B76B20B669F36-JKEMPIC]
Sent: 1/28/2020 4:49:00 PM
To: Jonathan Davis [jdavis@csg.org]
Subject: RE: Invitation to present in a webinar on the LCR

Jon,

I am trying to decide between the short overview presentation (about 17 slides) or the more detailed, which includes the overview (which I would mostly skip) and discusses in detail the proposed requirements (total of 45 slides, with 15 I would probably skip). Which slide deck do you think would be the appropriate one for Monday? Let me know when you get a chance. Thanks.

Jeff

From: Jonathan Davis <jdavis@csg.org>
Sent: Thursday, January 23, 2020 4:32 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Subject: RE: Invitation to present in a webinar on the LCR

Jeff,

Great news, and thanks. I'll look forward to the webinar.

Jon

From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Thursday, January 23, 2020 3:07 PM
To: Jonathan Davis <jdavis@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

Yes, I am available to proceed on Monday Feb 3. I will get you the picture and slides next week. Thanks.

Jeff

From: Jonathan Davis <jdavis@csg.org>
Sent: Tuesday, January 21, 2020 10:29 AM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Subject: FW: Invitation to present in a webinar on the LCR

Jeff,

Per my voice message, I'm following up on my email from Jan. 6 (below). Are you available to proceed on the morning of Monday, Feb. 3?

Thanks,

Jon Davis | Policy Analyst | Assistant Editor
The Council of State Governments, Midwestern Office
701 East 22nd Street, Suite 110 | Lombard, IL 60148
phone: 630.925.1922
www.csgmidwest.org

From: Jonathan Davis
Sent: Monday, January 6, 2020 4:23 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

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Can you please send us an image – preferably 300 dpi or better -- and also a title? And, so we can share the slidedeck in advance, can you please get your slides to me by Thursday, Jan. 30?

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From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Monday, January 6, 2020 1:27 PM
To: Jonathan Davis <jdavis@csg.org>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

[EXTERNAL EMAIL]

Jon,

That should work – the comment period was extended until February 12, 2020 recently:

https://www.federalregister.gov/documents/2019/12/19/2019-27282/national-primary-drinking-water-regulations-lead-and-copper-rule-revisions

The February 3date would still be within the comment period for the rule. You may want to allow more time as it may be tight to go over the proposed rule requirements and have a Q&A in all of those key areas of the proposed rule.

Hope that helps.

Jeff

Jeffrey Kempic
Treatment Technology and Cost Team Leader
Standards and Risk Management Division
Phone: (202) 564-4880

From: Jonathan Davis <jdavis@csg.org>
Sent: Friday, January 03, 2020 3:11 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

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From: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Sent: Friday, January 3, 2020 9:56 AM
To: Jonathan Davis <jdavis@csg.org>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: RE: Invitation to present in a webinar on the LCR

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Jon,

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From: Jonathan Davis <jdavis@csg.org>
Sent: Monday, December 30, 2019 12:21 PM
To: Kempic, Jeffrey <Kempic.Jeffrey@epa.gov>
Cc: Lisa Janairo <ljanairo@csg.org>
Subject: Invitation to present in a webinar on the LCR
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Sent: 1/23/2020 9:06:54 PM
To: Jonathan Davis [jdavis@csg.org]
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Sent: 1/6/2020 7:27:28 PM
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phone: 630.925.1922
www.csgmidwest.org

Appointment

From: Bridget O'Grady [bogrady@asdwa.org]
Sent: 4/4/2017 7:43:17 PM
To: Bridget O'Grady [bogrady@asdwa.org]; Mclain, Jennifer [Mclain.Jennifer@epa.gov]; Grevatt, Peter [Grevatt.Peter@epa.gov]; Christ, Lisa [Christ.Lisa@epa.gov]; cindy.christian@alaska.gov; Burneson, Eric [Burneson.Eric@epa.gov]; Thompkins, Anita [Thompkins.Anita@epa.gov]; kinarddb@dhec.sc.gov; Stephanie.Stringer_state.nm.us [Stephanie.Stringer@state.nm.us]; dosterhoudt@asdwa.org; aroberson@asdwa.org; June.swallow@health.ri.gov; czecholinski.daniel@azdeq.gov; Lori.mathieu@ct.gov; beth.messer@epa.ohio.gov; gwavra@nd.gov; Bergman, Ronald [Bergman.Ronald@epa.gov]; roger.sokol@health.ny.gov; Lopez-Carbo, Maria [Lopez-Carbo.Maria@epa.gov]; howard.isaacs@nebraska.gov; Lisa Daniels [ldaniels@pa.gov]; randy.ellingboe@state.mn.us

Subject: FW: Invitation: Conference Call - WIIN Act Amendments that Trigger Notifi... @ Thu Apr 20, 2017 3pm - 4:30pm (EDT) (grevatt.peter@epa.gov)
Attachments: invite.ics
Location: Dial - 1-877-885-3221/Passcode 4014084#

Start: 4/20/2017 7:00:00 PM
End: 4/20/2017 8:30:00 PM
Show Time As: Busy

-----Original Appointment-----
From: bogrady@asdwa.org [mailto:bogrady@asdwa.org]
Sent: Tuesday, April 04, 2017 3:34 PM
To: bogrady@asdwa.org; Grevatt, Peter; Christ, Lisa; cindy.christian@alaska.gov; Burneson, Eric; Thompkins, Anita; kinarddb@dhec.sc.gov; Stephanie.Stringer_state.nm.us; dosterhoudt@asdwa.org; aroberson@asdwa.org; June.swallow@health.ri.gov; czecholinski.daniel@azdeq.gov; Lori.mathieu@ct.gov; beth.messer@epa.ohio.gov; gwavra@nd.gov; Bergman, Ronald; roger.sokol@health.ny.gov; Lopez-Carbo, Maria; howard.isaacs@nebraska.gov; Lisa Daniels; randy.ellingboe@state.mn.us
Subject: Invitation: Conference Call - WIIN Act Amendments that Trigger Notifi... @ Thu Apr 20, 2017 3pm - 4:30pm (EDT) (grevatt.peter@epa.gov)
When: Thursday, April 20, 2017 3:00 PM-4:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Dial - 1-877-885-3221/Passcode 4014084#

more details »

Conference Call – WIIN Act Amendments that Trigger Notifications to Populations Affected by Lead

You are invited to participate in a conference call with Peter Grevatt, Director of EPA's Office of Ground Water and Drinking Water. The purpose of the call is to discuss the WIIN Act's public notification amendments to the Safe Drinking Water Act. We have also invited a few states to share their expedited implementation experiences.

There are two areas of focus for this call:

1. The WIIN Amendments require that public water systems issue a notice of action level exceedance within 24 hours of learning of the exceedance. EPA will need to codify these requirements into the Lead and Copper regulation. Do states have suggestions or recommendations on how to proceed? What concerns may states have that should be

addressed? Is there an option to include information on how notifications are provided and what documentation may be required?

2. Separately, EPA would like to engage with states that have been implementing notification requirements that are more stringent than the existing Federal regulation. The goal is to help EPA to learn more about challenges, best practices, and other implementation issues.

When	Thu Apr 20, 2017 3pm – 4:30pm Eastern Time
Where	Dial - 1-877-885-3221/Passcode 4014084# (map)
Joining info	meet.google.com/acb-shor-vxw
Calendar	grevatt.peter@epa.gov
Who	• bogrady@asdwa.org - organizer • grevatt.peter@epa.gov • christ.lisa@epa.gov • cindy.christian@alaska.gov • burneson.eric@epa.gov • thompkins.anita@epa.gov • kinarddb@dhec.sc.gov • stephanie.stringer@state.nm.us • dosterhoudt@asdwa.org • aroberson@asdwa.org • june.swallow@health.ri.gov • czecholinski.daniel@azdeq.gov • lori.mathieu@ct.gov • beth.messer@epa.ohio.gov • gwavra@nd.gov • bergman.ronald@epa.gov • roger.sokol@health.ny.gov • lopez-carbo.maria@epa.gov • howard.isaacs@nebraska.gov • ldaniels@pa.gov • randy.ellingboe@state.mn.us

Going? **Yes** - **Maybe** - **No** more options »

Appointment

From: bogrady@asdwa.org [bogrady@asdwa.org]
To: grevatt.peter@epa.gov; christ.lisa@epa.gov; bogrady@asdwa.org; cindy.christian@alaska.gov; burneson.eric@epa.gov; thompkins.anita@epa.gov; kinarddb@dhec.sc.gov; stephanie.stringer@state.nm.us; dosterhoudt@asdwa.org; aroberson@asdwa.org; june.swallow@health.ri.gov; czecholinski.daniel@azdeq.gov; lori.mathieu@ct.gov; beth.messer@epa.ohio.gov; gwavra@nd.gov; bergman.ronald@epa.gov; roger.sokol@health.ny.gov; lopez-carbo.maria@epa.gov; howard.isaacs@nebraska.gov; ldaniels@pa.gov; randy.ellingboe@state.mn.us

Subject: Conference Call – WIIN Act Amendments that Trigger Notifications to Populations Affected by Lead
Location: Dial - 1-877-885-3221/Passcode 4014084#

Start: 4/20/2017 7:00:00 PM
End: 4/20/2017 8:30:00 PM
Show Time As: Tentative

Recurrence: (none)

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This event has a video call.
Join: https://meet.google.com/acb-shor-vxw

View your event at
https://www.google.com/calendar/event?action=VIEW&eid=MHA2YWxlcTlzbGVodGdpcmF0ajgyYW45aWcgZ3JldmF0dC5wZXRlckBlcGEuZ292&tok=MTcjYm9ncmFkeUBhc2R3YS5vcmdlNmU0ZTMyMTg3YmVmZGM3YzcwNWY2NWE0MDI5YzY5NzY5NWFmNzg3&ctz=America/New_York&hl=en.

Message

From: Thompkins, Anita [Thompkins.Anita@epa.gov]
Sent: 6/21/2019 4:09:25 PM
To: aroberson@asdwa.org
CC: Wendi Wilkes [wwilkes@asdwa.org]; dosterhoudt@asdwa.org; Lopez-Carbo, Maria [Lopez-Carbo.Maria@epa.gov]; Davis, CatherineM [Davis.CatherineM@epa.gov]; Gonzalez, Yvonne V. [Gonzalez.Yvonne@epa.gov]; Bergman, Ronald [Bergman.Ronald@epa.gov]; Harris, Adrienne [Harris.Adrienne@epa.gov]; Kevin Letterly [kletterly@asdwa.org]; Wadlington, Christina [Wadlington.Christina@epa.gov]; Tiago, Joseph [Tiago.Joseph@epa.gov]; Guilaran, Yu-Ting [Guilaran.Yu-Ting@epa.gov]; Mclain, Jennifer [Mclain.Jennifer@epa.gov]; Ellenbogen, Victoria [Ellenbogen.Victoria@epa.gov]; Fort, Felecia [Fort.Felecia@epa.gov]
Subject: Release of the Implementation Document of the Lead Testing in Schools and Child Care Facilities Drinking Water Grant Program (SDWA 1469(d))
Attachments: Implementation Document for WIIN 2107_testing in schools_June 19 2019_FINAL.PDF; Work Plan Sample for WIIN 2107_June 2019_FINAL.PDF

Good Morning Alan and Happy Friday,

The EPA is preparing to announce the release of the Implementation Document and all attachments for the non-competitive grant under WIIN 2107: Lead Testing in Schools and Child Care Facilities. The drinking water grant will provide funding to the 50 States and the District of Columbia to establish or expand lead drinking water testing programs for schools and child care facilities.

The attached document provides the process for participating states and the District of Columbia to use to develop their respective application packages. The grantees are anticipated to use the EPA's 3T's for Reducing Lead in Drinking Water in Schools and Child Care Facilities guidance, or guidance applicable to an existing state program or regulation that is no less stringent than the 3T's guidance, in conjunction with the attached Implementation Document. They are also expected to draft workplan (sample work plan attached) and budget narratives and work with the regions to have the workplan and required package documents approved prior to applying for the grant. OGWDW is taking next steps toward opening the application in Grants.gov for state workplan submissions.

In addition, we have scheduled the next webinars for the lead testing grant and implementation on :

- **Thursday, June 27th | 11:30am-1:00 pm EDT| Register here!**

We will continue to provide follow-up information and FAQs at https://www.epa.gov/safewater/grants

Should you have any questions regarding this grant, please feel free to email Yvonne Gonzalez at Gonzalez.yvonne@epa.gov

Many Thanks,
Anita

Anita Maria Thompkins
Director, Drinking Water Protection Division
Office of Ground Water and Drinking Water
U.S. Environmental Protection Agency
Washington, DC
Office Phone: 202-564-5673
EPA Cell: 202-281-8430

*** STATE SAMPLE ***

2019 Grant Program

LEAD TESTING IN SCHOOL AND CHILD CARE PROGRAM DRINKING WATER GRANT

WORK PLAN FOR THE STATE OF NEW FOUNTAIN

Summary Statement

The State of New Fountain Department of Health (DOH) is committed to addressing lead in drinking water in our schools and child care facilities, and overall reduction of childhood lead exposure across our state. This is why, in 2018, Governor Yvonne Davis announced the statewide initiative to test schools and child care facilities using EPA's *3Ts for Reducing Lead in Drinking Water*. Since the start of the *Collaborative Action for Testing H2O Initiative* (the Initiative), we have sampled at 200 schools and taken action at those identified to have elevated lead levels.

With the funding appropriated under section 1464(d) of the Safe Drinking Water Act, amended by the Water Infrastructure Improvement Act (WIIN) section 2107, New Fountain DOH plans to continue the Initiative in testing our schools and child care facilitates. This will include the prioritization of facilities serving younger children (ages 6 and under), underserved and low-income communities, and facilities that are older and more likely to contain lead plumbing.

New Fountain DOH is using EPA's 3Ts guidance as a model to: (1) **Communicate,** throughout the implementation of the program, the results and important lead information to the public, parents, teachers, and larger community; (2) **Train** on the risks of lead in drinking water and testing for lead, as well as developing key partnerships to support the program; (3) **Test** using appropriate testing protocols and a certified laboratory; and (4) **Take Action**, including the development of a plan for responding to results of testing conducted and addressing potential elevated lead where necessary.

For more information on previous efforts conducted in New Fountain, please see: https//.doh.NF.gov/CATHI

SCOPE OF WORK

This section is a discussion of the New Fountain's plan to develop and implement the lead testing program in schools and child care facilities, *Collaborative Action for Testing H2O Initiative* (also known as the Initiative), and how these programs meet goals as they relate to the reduction of lead in drinking water exposure in children.

The scope of work contained in this project description includes the following categories and information.

I. STATE GOALS AND PRIORITIES
II. PROGRAM IMPLEMENTATION AND ACTIVITIES
III. ROLES AND RESPONSIBILITIES
IV. TIMELINE AND MILESTONES
V. WIIN PROGRAMMATIC PRIORITIES AND EPA'S STRATEGIC PLAN LINKAGE
VI. ANTICIPATED OUTCOMES/OUTPUTS
VII. BUDGET NARRATIVE

I. STATE/TERRITORY GOALS AND PRIORITIES:

New Fountain has 1,500,060 students enrolled in a total of 3,040 public schools in 800 school districts, and approximately 980,000 children participating in regular daycares at 18,000 facilities. New Fountain DOH has identified goals and priorities consistent the priorities outlined in EPA's State Lead Testing in School and Child Care Program Drinking Water Grant Implementation Document (found here: www.epa.gov/safewater/grants).

In accordance with the America's Waters Infrastructure Act (AWIA) of 2018, which amended the SDWA section 1464(d), New Fountain DOH will assist in voluntary testing for lead contamination in drinking water at schools and child care facilities that are in low-income areas. This is described based upon the affordability criteria established by the State under SDWA section 1452(d)(3). This may include Schools with at least 50% of the children receiving free and reduced lunch and Head Start facilities, for example.

Other priorities will include elementary and child care programs that primarily care for children 6 years and under; older facilities that are more likely to contain lead plumbing (e.g. facilities built before New Fountain's lead ban of 1988); and established and sustainable child care programs without factors indicating that the building may not be serving as a child care facility in the future.

It is New Fountain DOH's goal to reduce lead exposure at these facilities by testing for lead, identifying potential lead sources, and taking action. Using the priorities listed above, this testing effort includes the goals of:

a. Testing all outlets used for consumption at 35% of all schools and child care facilities in low-income areas by the end of the project period.

b. Testing all outlets used for consumption at 8% of the total child care facilities in the state with a plan to continue testing after the project period.

c. Testing all outlets used for consumption at 15% of the total schools in the state with a plan to continue testing after the project period.

d. Providing education about lead and the importance of testing to all 800 school districts.

II. PROGRAM IMPLEMENTATION AND ACTIVITIES:

New Fountain DOH is utilizing EPA's 3Ts guidance (*www.epa.gov/safewater/3ts)* to implement the *Collaborative Action for Testing H2O Initiative* (the Initiative). This includes efforts to (1) **Communicate**, throughout the implementation of the program, the results and important lead information to the public, parents, teachers, and larger community; (2) **Train** on the risks of lead in drinking water and testing for lead, as well as developing key partnerships to support the program; (3) **Test** using appropriate testing protocols and a certified laboratory; and (4) **Take Action**, including the development of a plan for responding to results of testing conducted and addressing potential elevated lead where necessary. Below are specific activities included in these key elements:

a. **Communication**: New Fountain DOH will establish key partnerships to support the program as well as keeping the public informed (see more on partnerships in Appendix A). New Fountain recognizes that timely dissemination of communication materials is of the utmost importance. Therefore, information about the sampling program and lead in drinking water will be shared before the lead in drinking water sampling program begins, after obtaining the results of testing, when/if corrective measures are decided upon (and in the event no corrective measures are appropriate because the lead levels are low), and in response to periodic interest in the program. Specifically:

- Notifications will occur at least 30 days prior to testing at that facility
- Testing results will be shared with the school or child care community as soon as possible, but no later than 2 weeks following the receipt of the final results.
- Press releases and public meetings will be held, in collaboration with school district and child care program leaders, at least once a year.
- General public education and updates to the testing website will be made on an ongoing basis and can be accessed by the public (https//.doh.NF.gov/CATHI).

New Fountain DOH will be using a variety of methods to communicate and be transparent throughout this program with the goal of reaching the target audiences; including: press releases, letters/fliers, mailbox or paycheck stuffers, staff newsletters, presentations, email and websites (https//.doh.NF.gov/CATHI), and social media. There will also be a hotline made available for any additional questions or requests for information: 1-800-NFCATHI. In addition, schools and child care facilities will make available, in the administrative offices and on their public website, if applicable, a copy of the results of any voluntary testing.

New Fountain DOH has identified our target audiences as: the school or child care community (e.g. parents, teachers, and staff), the building community, the larger community, local community organizations (e.g. local health officials, environmental health specialists, doctors, and nurses, Lead Poisoning Prevention Programs, and civic and faith-based groups), and the drinking water community (e.g. utilities serving these facilities).

b. **Training**: Training will include education and training on the risks of lead in drinking water and testing for lead to the community or surrounding residential area that is impacted by testing, as well as key partnerships to support the program (see more on partnerships in Appendix A). New Fountain will also post resources and materials on its website for access by the public. Training will include the causes and health effects of lead in drinking water; as well as training on program plan and sampling procedures.

   New Fountain will be working with a third-party contractor, KaraConsulting, Inc., to reach stakeholders and disseminate information.

   New Fountain will also be developing key partnerships to support the program and help train staff. These are detailed in Appendix A.

c. **Testing**: New Fountain DOH is utilizing EPA's 3Ts guidance 2-step sampling protocol, as described at https://www.epa.gov/sites/production/files/2018-09/documents/module_5_3ts_2-step_sampling_protocol_508.pdf, and the New Fountain DOH laboratory, which is certified to test lead in drinking water, to process and analyze samples collected under this program. To reach as many facilities as possible, we will be taking the initial 250 mL first draw sample at each tap and following up with the flush samples at locations identified with elevated lead. Outlets not being tested will be labeled as "not for drinking water." This may include utility sinks and certain bathroom sinks.

   New Fountain will be working with the University of New Fountain to develop sampling plans and conduct initial site assessment, as well as collect initial and follow-up flush samples at identified facilities. New Fountain anticipates:

   - 1,440 child care facilities to be tested;
   - 456 schools to be tested; and
   - 10% of the taps to require additional sampling (e.g. follow-up flush sampling).

   All sampling efforts under this program will be properly coded and recorded using the coding system and recordkeeping recommendations identified in EPA's 3Ts guidance.

d. **Taking Action**: New Fountain has developed a plan for responding to results of testing conducted and addressing potential elevated lead where necessary. Responses to results will follow remediation recommendations in the 3Ts guidance. The Initiative includes action at sample sites with results above the state action level of 15 parts per billion (the action level in the federal Lead and Copper Rule). This plan also includes the sampling post-remediation to ensure efforts to reduce lead levels were effective.

Resources that have previously been made available for testing for lead contamination in drinking water in schools of the Juarez and Jester communities will not be replaced by funds provided from this SDWA 1464(d) grant. Grant funding will be used to supplement and enhance existing resources.

III. ROLES AND RESPONSIBILITIES:

A list of roles and responsibilities are listed below, and potential project partners are identified in Appendix A.

3Ts Program Contact: This person will act as the point of contact for your 3Ts Program and help coordinate the communication efforts.	**Sarah Bradbury, NF DOH** 123 Watertown Rd. Three T, NF 12345 bradburys@doh.nf.gov
Public Communications Team: Communicate testing plans, results, and remediation efforts to the public. The public consists of, but is not limited to, the school community, media outlets, civic groups, etc.	*Staff, New Fountain DOH* with support from health officials to communicate lead exposure risks and options for getting your child's blood tested.
Public Hotline: This person will monitor the hotline (1-800-NFCATHI) to ensure questions and concerns are being responded to.	*Staff, New Fountain DOH*
Website and Social Media Contact: This person will make sure websites (https//.doh.NF.gov/CATHI) and social media stay up to date with the latest information.	*Staff, New Fountain DOH* with support from KaraConsulting, Inc.
Partner Liaison Contact: This person will work with certified laboratories, interest groups, the school board, and other partners supporting and interested in the school's 3Ts Program to schedule activities and maintain communication.	*Staff, New Fountain DOH*
Sampling Plan and Execution Contact: This person will lead the effort to develop a sampling plan for the school. They will also engage with other program points of contact and external resources and partners as appropriate.	**Michael Gonzalez, NF DOH** 123 Watertown Rd. Three T, NF 12345 gonzalezm@doh.nf.gov **Leslie Temple, University of NF** 321 University Way. Testing, NF 54321 LeslieT@UFN.edu

Remediation Activities Contact: This person will lead the remediation efforts, if necessary, and engage with other program points of contact and external partners as appropriate, acting as the Program point of contact for those resources.	**Michael Gonzalez, NF DOH** 123 Watertown Rd. Three T, NF 12345 gonzalezm@doh.nf.gov **Leslie Temple, University of NF** 321 University Way. Testing, NF 54321 LeslieT@UFN.edu
Recordkeeping Contact: Ensure a central repository is created to house all 3Ts Program documents. Lead effort to create, maintain and update documentation with the team annually.	*Staff, New Fountain DOH and individual grantees.*

IV. TIMELINE AND MILESTONES:

A detailed timeline for the project, including milestones for specific tasks, can be found below.

- **FY2019 Quarter 4:** Begin assembling program team; publish resources and information on New Fountain webpage; receive funding from federal award agency.
- **FY2020 Quarter 1:** Solicitation of project partners, notification to sub awardees; beginning of public communication about the grant program and training of program personnel; and beginning collection of important information pertaining to sampling (e.g. past sampling activities, records, building construction, building layouts).
  - New Fountian DOH first press release and public meeting.
- **FY2020 Quarter 2:** Continue to develop sample site plans (including any plumbing profiles and/or walk-throughs needed for first set of facilities); notify the school and child care community of plan to sample and important information about lead in drinking water; and begin initial sampling at facilities identified by the priorities listed in the previous section.
- **FY2020 Quarter 3:** Continue to develop sample site plans; notify school and child care community of plan to sample and important information about lead in drinking water; and conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share result of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; conduct follow-up sampling where needed.
  - New Fountian DOH second press release and public meeting.
- **FY2020 Quarter 4:** Conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share results of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; inform sub

awardees on routine practices that can improve water quality (especially as some facilities close and open for summer months).

- **FY2021 Quarter 1:** Continue to develop sample site plans; notify school and child care community of plan to sample and important information about lead in drinking water; and conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share result of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; conduct follow-up sampling where needed.
  - **New Fountain DOH expects to have sampled at 35% of the total schools and child care facilities noted in this workplan by this point.**
- **FY2021 Quarter 2:** Continue to develop sample site plans; notify school and child care community of plan to sample and important information about lead in drinking water; and conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share result of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; conduct follow-up sampling where needed.
- **FY2021 Quarter 3:** Continue to develop sample site plans; notify school and child care community of plan to sample and important information about lead in drinking water; and conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share result of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; inform sub awardees on routine practices that can improve water quality (especially as some facilities close and open for summer months).
- **FY2021 Quarter 4:** Continue to develop sample site plans; notify school and child care community of plan to sample and important information about lead in drinking water; and conduct initial sampling at facilities identified by the priorities listed in the previous section; take action where elevated lead levels are identified; share result of testing as soon as possible but no later than two weeks after receipt of final results; support schools and child care programs in community outreach; conduct follow-up sampling where needed; inform sub awardees on routine practices that can improve water quality (especially as some facilities close and open for summer months).
  - New Fountian DOH third press release and public meeting.
  - **New Fountain DOH expects to have sampled at 100% of the total schools and child care facilities noted in this workplan by this point.**

Additional information will be provided by EPA in the Terms and Conditions for project completion. The project objectives and milestones will align with the terms and conditions as required by the Agency.

V. WIIN PROGRAMMATIC PRIORITIES AND EPA'S STRATEGIC PLAN:

The principal objective of the assistance to be awarded under this program is to provide grants to states to help local education agencies to test schools and child care facilities for lead contamination in drinking water, utilizing EPA's 3Ts guidance or applicable state regulations or guidance that are not less stringent. The objective of the Program is to: (1) Reduce children's exposure to lead in drinking water; (2) Help states target funding toward schools and child care programs unable to pay for testing; (3) Utilize the 3Ts model or model no less stringent to establish best practices for a lead in drinking water prevention program; (4) Foster sustainable partnerships at the state and local level to allow for more efficient use of existing resources and exchange of information among experts in various educational and health sectors; and (5) Enhance community, parent, and teacher cooperation and trust.

The activities described in this workplan support the WIIN Programmatic Priorities and EPA's FY 2018-22 Strategic Plan, Goal 1, "Core Mission: Deliver real results to provide Americans with clean air, land, and water, and ensure chemical safety," Objective 1.2, "Provide for Clean and Safe Drinking Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsistence activities."

VI. ANTICIPATED OUTCOMES/OUTPUTS:

Outputs and outcomes expected to be achieved under the agreement are described below.

Outputs for this project include: (1) Use the EPA's 3Ts for Reducing Lead in Drinking Water guidance to implement the state program; (2) Development of a state lead testing in drinking water in schools and childcare facilities management strategy that supports a robust training, monitoring, and maintenance plan that protects children from lead exposure now and in the future; (3) Prioritization of testing to target vulnerable communities and populations: schools and child care programs in underserved and/or low-income communities; elementary and child care programs that primarily care for children 6 years and under; and older facilities that are more likely to contain lead plumbing; (4) Providing results of any voluntary testing for lead contamination in school and child care facility drinking water carried out using grant funds and notifying parents, teachers, and organizations of the availability of the results; (5) Developing a regular lead testing program under the Initiative; and (6) Establishment of routine practices such as those outlined in the 3Ts guidance.

Outputs also include the establishment of a memorandum of agreement (MOA) with the University of New Fountain to implement this program.

Outcomes: for this projects include: (1) Schools or child care programs, unable to pay for testing, implementing a testing program and mitigating lead exposure by utilizing the 3Ts toolkit in determining best action to take for remediation; (2) The reduction of children's exposure to lead in drinking water; (3) Improvement of staff and community knowledge on lead in drinking water and other environmental harms; and (5) Water quality improvement and lead exposure reduction in drinking water; and (6) Establishment of routine practices such as those outlined in the 3Ts guidance.

Other outcomes include: (1) Fostering sustainable partnerships at the state and local level to allow for a more efficient use of resources and the exchange of information among experts in various areas of school, child care, utility, and health sectors; and (2) The enhancement of community, parent, and teacher trust.

VII. BUDGET NARRATIVE:

[*This section of the work plan should include a detailed itemized budget proposal (in addition to the Standard Form 424A). Justify the expenses for each of the categories being performed within the grant/project period. Indicate which costs will be paid by the state's or territory's allocation from EPA and which costs will be paid by the state's or territory's voluntary funds, if applicable. Voluntary funds by the state or territory is not a grant requirement. Applicants must itemize costs related to personnel, fringe benefits, travel, equipment, supplies, contractual costs, other direct costs, indirect costs, and total costs.*]

View EPA's *Interim General Budget Development Guidance for Applicants and Recipients of EPA Financial Assistance.* This interim guidance is a tool that may be used by applicants and recipients of EPA funds when preparing proposed work plans, budgets, and budget narratives for EPA assistance agreements for project grants/cooperative agreements and continuing environmental program (CEP) grants.

Link: https://www.epa.gov/sites/production/files/2019-05/documents/applicant-budget-development-guidance.pdf

APPENDIX A: PARTNERS UNDER THIS PROGRAM

Below are partners that will be involved in this program.

The University of New Fountain, Department of Environment Health

321 University Way.
Testing, NF 54321
LeslieT@UFN.edu

KaraConsulting, Inc

567 Remediation Rd.
Testing, NF 54321
Belle@KC.com

The Collation of New Fountain Water Utilities

www.CNFWU.org

Parents for Healthy New Fountain Schools

www.ParentsforHealthyNFSchools.com

Pediatricians of New Fountain Committee

www.PediatriciansofNF.org

Additional Partners will include:

- Local Health Departments
- Water Utilities
- School Principals/Directors
- School board
- School nurse, Cafeteria staff, Athletics staff, and Teachers
- Parents and Parent Teacher Associations (PTAs)
- Local plumbing and construction contractors/suppliers

Message

From: Bromberg, Kevin L. [kevin.bromberg@sba.gov]
Sent: 12/12/2018 3:09:30 PM
To: 'jlaity@omb.eop.gov' (jlaity@omb.eop.gov) [jlaity@omb.eop.gov]; Dorjets, Vlad (Vladik_Dorjets@omb.eop.gov) [Vladik_Dorjets@omb.eop.gov]
CC: Mike Keegan [keegan@ruralwater.org]; svia@awwa.org; Mclain, Jennifer [Mclain.Jennifer@epa.gov]
Subject: Michigan News - LCR

Communities Sue Over Michigan's Tough Lead Rules for Water

December 11, 2018 6:57PM ET

By JEFF KAROUB

Detroit (AP) -- Local governments and utilities sued the state of Michigan Tuesday over its implementation of the nation's toughest drinking water rules for lead, saying they support strong action against public exposure to the toxin but find the new rules arbitrary and too costly for the communities left to foot the bill for the work to be done.

The Detroit-area coalition filed the suit against the Michigan Department of Environmental Quality in the state's Court of Claims. They argue the changes made in June place a heavy financial burden on communities, infringe on private property rights and don't reach problematic fixtures inside residences.

Underground lead service lines connecting water mains to houses and other buildings would be replaced by 2040, unless a utility can show regulators it will take longer under a broader plan to repair and replace its water infrastructure. The so-called action level for lead would drop from 15 parts per billion — the federal limit — to 12 parts per billion in 2025.

"MDEQ has mandated service line replacement without any consideration, guidance, fact-finding, or solution for funding the enormous cost of this statewide infrastructure upgrade, particularly in the context of affordability, and how water supplies should fund these improvements while balancing their other public health and permit related infrastructure and legal obligations," wrote the plaintiffs, who include the Great Lakes Water Authority, Detroit Water and Sewerage Department and Oakland County's water resources commissioner.

State officials have said Flint's water crisis exposed problems with lead rules and Michigan needed to adopt changes, adding that local governments have years to prepare. Republican Gov. Rick Snyder, whose administration has been blamed for Flint's emergency, has called the federal rules "dumb and dangerous."

The environmental group Natural Resources Defense Council said in a release before the expected filing that the new rule "was drafted to prevent further situations like the water crisis in Flint." It adds the case "threatens to re-open the state's ugly drinking water history."

svia

Message

From: Mike Keegan [keegan@nrwa.org]
Sent: 8/14/2020 4:34:59 PM
To: Ross, David P [ross.davidp@epa.gov]
CC: matt [matt@nrwa.org]; Paul Fulgham [pfulgham@tremontoncity.com]; aroberson@asdwa.org
Subject: Safe Drinking Water Act variances and Denver Water
Attachments: Denver Variance NRWA.pdf

Mr. Ross, NRWA was not able to file comments during the EPA's comment period concerning the granting of a variance to Denver Water earlier this year. However, we wanted to make the Agency aware of our concerns with SDWA variance implementation and urge you to make these comments part of the public record for Denver Water's variance.

Thank you, and our comments are attached,

Mike Keegan, *Analyst*
National Rural Water Association
Washington, DC

NRWA

TO: **The Honorable Dave Ross**
Assistant Administrator of the Office of Water
U.S. Environmental Protection Agency
FROM: **National Rural Water Association** (contact: Mike Keegan)
DATE: **August 14, 2020**
RE: **Variance Decision for Denver Water, EPA-R08-OW-2019-0404**

We were not able to file comments during the Environmental Protection Agency's (EPA) public comment period concerning the granting of a Safe Drinking Water Act (SDWA) variance to Denver Water earlier this year. However, with recent attention in Congress and the stakeholder community to implementation of the standard setting section and compliance policies for small community water systems under the SDWA, we wanted to make the Agency aware of our concerns with SDWA variance implementation and urge you to make these comments part of the public record for Denver Water's variance. We believe the EPA should provide small and rural communities the same opportunity for variances as Denver Water and other large communities.

In 2012, Denver Water exceeded the federal lead action level of 15 mg/L. On March 20, 2018, the state required Denver Water to install and operate orthophosphate by March 20, 2020. On September 6, 2019, Denver Water requested a variance of the requirements of the federal lead rule. On December 16, 2019, EPA approved Denver Water's variance request from certain compliance requirements with the Lead and Copper Rule. The variance will allow Denver Water to implement a lead reduction program as an alternative to using orthophosphate as a corrosion control treatment to reduce lead concentrations in drinking water.

For the small communities in violation of the lead rule treatment technique, none were offered the alternative compliance scheme provided to Denver Water. Moreover, they have likely introduced orthophosphate into their communities' drinking water supply already as well as their wastewater effluent waters.

The variance provisions were included in the SDWA by Congress to assist small communities comply with federal drinking water standards, in an affordable manner, that are crafted based on the economic "feasibility" of a large metropolitan water utility. To date, the Agency has determined all regulations are affordable for small communities and therefore precluded any use of variance technologies.

Denver Water's lead reduction plan includes five programmatic requirements necessary for implementation to comply with the variance. The variance does not identify any measurable water quality testing metrics for the variance (i.e. any metric similar to the clear and measurable 90th percentile action level compliance scheme in the current rule that all other communities must meet to avoid civil enforcement actions and alarming mandatory public notices). If there were clear and measurable water quality test; metrics for compliance with the variance, EPA could simply extend this new policy to all other public water systems covered by the rule - allowing for equal treatment of all communities under the rule. In addition to our concerns over the lack of measurable water quality compliance test metrics, the proposal does not clearly provide criteria for granting the variance. For example, EPA finds relevance in that, "Denver

Water's 90th percentile lead levels have consistently been below the lead action level since 1997 (except in 2012)." We read this to imply that the public should not be alarmed over Denver Water's 2012 action level exceedance to the point that Denver Water should not implement the full suite of compliance requirements under the rule (including the addition of orthophosphate). In some communities, exceedance of the action level is causing the public to stop using the drinking water and this is occurring in cases where only one house exceeds that action level. If there is a degree of action level exceedance that is: (1) not a public health risk; (2) an acceptable health risk; or (3) does not necessitate the rule's current compliance regime - the public should know this. We urge the Agency to disclose this information to the public.

Without any measure of water quality testing metrics for the variance (comparable to the 90th percentile action level tests) or measurable criteria for eligibility for the variance, it appears these judgments become subjective. Such subjectivity in implementing the SDWA is problematic because it allows for unequal treatment of various communities based on who is making the judgments governing the variance or other factors not subject to review under any clear principle. Also problematic with respect to introducing subjectively into compliance decisions with federal regulatory actions is the likelihood that a decision made by the regulator will be contrary to the public's expressed interests without opportunity for public redress.

EPA should allow all public water systems in noncompliance with the Lead and Copper Rule and all other National Primary Drinking Water Regulations access to this preferred compliance option. This is especially urgent in small and rural communities as compliance costs for EPA rules can result in a much greater economic hardship and cost per capita due to small communities' limited ability to afford compliance.

EPA's SDWA database (FY2019) lists 2,491 communities serving less than 10,000 persons in violation of "MCLs" (389 arsenic, 85 inorganics, 481 nitrates, 209 radionuclides, 448 total coliform, 946 disinfection byproducts, 5 synthetic organics, and 9 volatile organics). Additionally, the database lists 476 small communities in treatment technique violation of the Lead and Copper Rule. Many of these violations are for naturally occurring elements in ground water or byproducts from the disinfection process - not from anthropogenic contamination sources - and at levels where there is not actually a health risk compared to the compliance level/standard. However, the cost of compliance for many of these communities would be greater per household than the cost of adding orthophosphate as a corrosion control treatment for Denver Water. This results in a dynamic where many small communities have: violations that are less dangerous to the public than Denver Water's violation; compliance costs greater than Denver Water; and no similar opportunity to realize the benefits of variances.

Some stakeholders oppose utilization of the variance provisions because of the complexity and, in their opinion, the potential for the creation of a two-tiered standard setting program. However, only one of the standards (i.e. the unreasonable risk to health variance standard) is a health-based standard which is the one the public really wants to know - and the one that is not provided.

Congress authorized the variance process to maximize public health benefits in small and rural communities. In 1996, Congress envisioned a new law with provisions to assist small communities as described by Senator Baucus on the Senate Floor, *"The bill provides special help to small systems that cannot afford to comply with the drinking water regulations and can benefit from technologies geared specifically to the needs of small systems. Here is how it would work. Any system serving 10,000 people or fewer may request a variance to install special small system technology identified by EPA. What this means is that if a small system* *cannot afford to comply with current regulations through conventional treatment, the system can comply with the act by installing affordable small system technology."* EPA's current public water system inventory includes 45,693 U.S. community water systems and 143,932 public water systems serving less than 10,000 people (all regulated under the SDWA). To date, EPA has not allowed any one of them the opportunity to use a variance or variance technology for compliance.

Before a variance is granted to a small community under Sections 1415(a)(1) and 1415(e), the state or the EPA must find that the variance will "not result in an unreasonable risk to health," and "ensure adequate protection of public health." They must also find compliance, without the variance, is not "affordable" for the community (a harm). EPA has set an "affordability" level in regulation that is clearly not affordable to many small and economically disadvantaged communities. And EPA has never identified a reasonable definition of what level of any regulated substance presents "an unreasonable risk to health."

To determine affordability, EPA adopted a policy that families can afford annual water rates of 2.5% of median household income (MHI). The use of MHI computed as a national aggregate as the sole metric for determining affordability has many problems and should be revised to be reasonable for small communities while allowing access to affordable compliance treatment options. EPA has stated that the purpose of their affordability determination is to "look across all the households in a given size category of systems and determine what is affordable to the typical, or middle of the road household" [Federal Register (Jan. 22, 2001) 6975-7066]. EPA's MHI standard does not consider the quantity, concentration, rural demographics, and financial abilities of low-income families or disadvantaged populations to afford the rule as required by the Agency's Environmental Justice Policy [Executive Order 12898].

Prompted by the revised arsenic standard and its potential cost to small communities, the [Congressional] conference report for EPA's FY2002 appropriations bill (H.Rept. 107-272) directed EPA to review its affordability criteria and how small system variance programs should be implemented for the arsenic rule. After the review, EPA concluded the following in March 2006: *"Some stakeholders have argued that the current criteria are too stringent and fail to recognize situations in which a significant minority of systems within a size category may find a regulation unaffordable. After seven years of experience with the current criteria, EPA agrees it is time to consider refinements to address the situations of communities with below average incomes or above average drinking water and treatment costs"* (FR p.10671 – March 2006). EPA has not finalized a new policy after making this declaration in 2006.

EPA has also limited access to variance solutions by not identifying the drinking water public health levels created by Congress in the SDWA that is protective of public health (PPH) or an unreasonable risk to health (URTH). EPA has only identified the technology-driven maximum contaminant levels (MCLs) for regulated substances. EPA should identify what constitutes PPH and URTH as contemplated by the SDWA for all contaminants or provide a clear definition of a principle for determining such levels.

In addition to the variance authority cited for the Denver Water variance, Section 1415(a)(3) of the SDWA includes additional similar authorities including:

- Section 1415(a)(1) which allows for a variance "on the condition that the system install the best technology, treatment techniques, or other means..." and where the variance will "not result in an unreasonable risk to health."

- Section 1415(e) which allows for small system variance if a small system "cannot afford to comply" with the federal regulation and "the public water system installs, operates, and maintains, in accordance with guidance or regulations issued by the Administrator, such [variance] treatment technology, treatment technique, or other means..." and the variance will "ensure adequate protection of human health..."

Congress included the variance provisions in the SDWA standard setting process to allow for flexibility in implementation of federal regulations and to avoid any unintended adverse consequences in small communities resulting from compliance with federal regulations. However, the Act's variance provisions have not been made available to small communities in a manner intended by Congress. We urge the Agency to make the small community variance concept workable or consider reporting that the variance provisions may be too ambiguous for a regulatory agency to successfully implement.

Headquartered in Duncan (Oklahoma), the National Rural Water Association (NRWA) is the non-profit association of the federated state rural water associations with a combined membership of over 30,000 small and rural communities. NRWA is the country's largest water utility association and the largest community-based environmental organization. State Rural Water Associations are non-profit associations governed by elected board members from the membership. Our member utilities have the very important public responsibility of complying with all applicable U.S. Environmental Protection Agency (EPA) regulations and for supplying the public with safe drinking water and sanitation every second of every day.
